Seronics Co.,Ltd
#36, Suchul-daero, 9(gu)-gil,
Gumi-si, 39269, South Korea

RF Module Test Report Cover Letter

Dec. 31, 2020

We guarantee that the original test result (RYYWYSAGVDXG) and the test result of the new condition (2AX4BSC00DA) are the same.

RYYWYSAGVDXG is installed and used in the 2AX4BSC00DA without change.

2AX4BSC00DA has no RF output function except RYYWYSAGVDXG, so it does not affect the performance and characteristics of the RYYWYSAGVDXG.

Sincerely,

Client's signature 

Client's name : Young Su Park

Title : Principal Research Engineer

Contact information : +82-54-468-6140

Address : #36, Suchul-daero, 9(gu)-gil, Gumi-si, 39269, South Korea

RADIO TEST REPORT

Test Report No. : 12193629S-A-R2

Applicant	:	**TAIYO YUDEN CO., LTD.**
Type of Equipment	:	**Wireless LAN & Bluetooth Combo Module**
Model No.	:	**WYSAGVDXG, WYSEGVDXG** ***Wireless LAN/ Bluetooth Low Energy part**
FCC ID	:	**RYYWYSAGVDXG**
Test regulation	:	**FCC Part 15 Subpart C: 2018**
Test Result	:	**Complied (Refer to SECTION 3.2)**

1. This test report shall not be reproduced in full or partial, without the written approval of UL Japan, Inc.
2. The results in this report apply only to the sample tested.
3. This sample tested is in compliance with the limits of the above regulation.
4. The test results in this test report are traceable to the national or international standards.
5. This test report must not be used by the customer to claim product certification, approval, or endorsement by any agency of the Federal Government.
6. This test report covers Radio technical requirements.
It does not cover administrative issues such as Manual or non-Radio test related Requirements. (if applicable)
7. The all test items in this test report are conducted by UL Japan, Inc. Shonan EMC Lab.
8. The opinions and the interpretations to the result of the description in this report are outside scopes where UL Japan has been accredited.
9. The information provided from the customer for this report is identified in SECTION 1.
10. This report is a revised version of 12193629S-A-R1. 12193629S-A-R1 is replaced with this report.

Date of test: March 16 to April 27, 2018

Representative test engineer:
Yosuke Ishikawa
Engineer
Consumer Technology Division

Approved by:
Akio Hayashi
Leader
Consumer Technology Division

RTL02610

☐ The testing in which "Non-accreditation" is displayed is outside the accreditation scopes in UL Japan.
☒ There is no testing item of "Non-accreditation".

UL Japan, Inc.
Shonan EMC Lab.
1-22-3 Megumigaoka, Hiratsuka-shi, Kanagawa-ken, 259-1220 JAPAN
Telephone : +81 463 50 6400
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REVISION HISTORY

Original Test Report No.: 12193629S-A

Revision	Test report No.	Date	Page revised	Contents
- (Original)	12193629S-A	June 27, 2018	-	-
1	12193629S-A-R1	March 28, 2019	1	Addition of Comment "(Refer to SECTION 3.2)" " 9. The information…"
			4	Addition of Comment "The information…" "(Information from test lab.)" Addition of Similar model Correction of Rating "Vmain: DC 3 V-3.6 V VIO: DC 5 V -> VIO : DC 1.8/ 3.3 V, VDD33 : DC 3.3 V"
			5	Correction of Antenna Gain "-0.1 dBi ->2.1 dBi" "4.4 dBi (1001932PT and 1001932FT), 2.2 dBi (AH104N2450D1) -> 4.5 dBi (1001932PT), 4.4 dBi (1001932FT), 2.4 dBi (AH104N2450D1)" Deletion of Comment "*EUT has two external antennas …"
			6	Addition of Comment "*2) Since measurement…" "a) - f) Refer to APPENDIX 1 …"
			7	Addition of Comment "b) Refer to APPENDIX 1 …"
			9	Deletion of Comment "only only 11n-20 -> only 11n-20" Addition of Comment "(Radiated) *4)"
			10	Addition of Item "F : Jig Board…" Addition of Comment "*3) VIO is converted…" Correction of Diagram
			11	Addition of Figure (Conducted emission)
			12	Deletion of Test Distance
			13	Addition of Figure (Radiated emission)
			44	Correction of Frequency "2412, 2437, 2462 -> 2402, 2440, 2480"
2	12193629S-A-R2	April 9, 2019	10	Addition of Serial number A: "TYWLAN-AC3FA4001B79 *1), TYWLAN-AC3FA4001B7D *2)" Deletion of Serial number C: "TYWLAN-AC3FA4001B79 *1)"
			13	Correction of *Test Distance External Antenna type: "0.08 m -> 3.92 m" Chip Antenna type: "0.05 m -> 3.95 m"

CONTENTS **PAGE**

SECTION 1: Customer information

Company Name	:	TAIYO YUDEN CO., LTD.
Address	:	8-1 Sakae-cho Takasaki-shi Gunma 370-8522 Japan
Telephone Number	:	+81-27-324-2313
Facsimile Number	:	+81-27-324-2314
Contact Person	:	Masaki Naganuma

The information provided from the customer is as follows;
- Applicant, Type of Equipment, Model No., FCC ID on the cover and other relevant pages
- SECTION 1: Customer information
- SECTION 2: Equipment under test (E.U.T.)
- SECTION 4: Operation of E.U.T. during testing

* The laboratory is exempted from liability of any test results affected from the above information in SECTION 2 and 4.

SECTION 2: Equipment under test (E.U.T.)

2.1 Identification of E.U.T.

Type of Equipment	:	Wireless LAN & Bluetooth Combo Module
Model No.	:	WYSAGVDXG, WYSEGVDXG
Serial No.	:	Refer to Section 4, Clause 4.2
Rating	:	VIO : DC 1.8/ 3.3 V, VDD 33 : DC 3.3 V
Receipt Date of Sample (Information from test lab.)	:	March 14, 2018
Country of Mass-production	:	Japan
Condition of EUT	:	Engineering prototype (Not for Sale: This sample is equivalent to mass-produced items.)
Modification of EUT	:	No Modification by the test lab

2.2 Product Description

Model: WYSAGVDXG, WYSEGVDXG (referred to as the EUT in this report) is a Wireless LAN & Bluetooth Combo Module.
Differences between WYSAGVDXG and WYSEGVDXG are as follows.
- WYSAGVDXG: Internal Antenna type (Chip Antenna)
- WYSEGVDXG: External Antenna type

Similar model : WYSAGVDXG-F, WYSEGVDXG-F

Radio Specification

Radio Type	:	Transceiver
Frequency of Operation	:	2.4 GHz: 2402 MHz - 2480 MHz (Bluetooth BDR/EDR, Bluetooth Low Energy) 2412 MHz - 2462 MHz (IEEE 802.11b/g/11n-20) 2422 MHz - 2452 MHz (IEEE 802.11n-40) U-NII-1 / U-NII-2 A: 5180 MHz - 5320 MHz (IEEE 802.11a/n-20/ac-20) 5190 MHz - 5310 MHz (IEEE 802.11n-40/ac-40) 5210 MHz - 5290 MHz (IEEE 802.11ac-80) U-NII-2C : 5500 MHz - 5700 MHz (IEEE 802.11a/n-20/ac-20) 5510 MHz - 5670 MHz (IEEE 802.11n-40/ac-40) 5530 MHz - 5610 MHz (IEEE 802.11ac-80) U-NII-3: 5745 MHz - 5825 MHz (IEEE 802.11a/n-20/ac-20) 5755 MHz - 5795 MHz (IEEE 802.11n-40/ac-40) 5775 MHz (IEEE 802.11ac-80)
Modulation	:	DSSS : IEEE 802.11b OFDM : IEEE 802.11g/n/a/ac FHSS(GFSK, /4-DQPSK, 8DPSK) : Bluetooth BDR/EDR GFSK : Bluetooth Low Energy
Antenna type	:	[WYSAGVDXG] Chip Antenna (AH104N2450D1) [WYSEGVDXG] External Antenna (1001932PT and 1001932FT)
Antenna Gain	:	2.4 GHz: 2.5 dBi (1001932PT and 1001932FT), 2.1 dBi (AH104N2450D1) 5 GHz: 4.5 dBi (1001932PT), 4.4 dBi (1001932FT), 2.4 dBi (AH104N2450D1)
Operating Temperature	:	-30 deg. C to +85 deg. C
Clock frequency	:	37.4 MHz

SECTION 3: Test specification, procedures & results

3.1 Test Specification

Test Specification : FCC Part 15 Subpart C
FCC Part 15 final revised on March 12, 2018 and effective April 11, 2018

Title : FCC 47CFR Part15 Radio Frequency Device Subpart C Intentional Radiators
Section 15.207 Conducted limits
Section 15.247 Operation within the bands 902-928MHz, 2400-2483.5MHz, and 5725-5850MHz

3.2 Procedures and results

Item	Test Procedure *2)	Specification	Worst margin	Results	Remarks
Conducted Emission	**FCC:** ANSI C63.10-2013 6. Standard test methods	**FCC:** Section 15.207	17.2 dB, 2.50664 MHz, N, WLAN 11n-20, 2462 MHz, V main, Antenna : 1001932PT	Complied a)	-
	IC: RSS-Gen 8.8	**IC:** RSS-Gen 8.8			
6dB Bandwidth	**FCC:** KDB 558074 D01 DTS Meas Guidance v04	**FCC:** Section 15.247(a)(2)	See data.	Complied b)	Conducted
	IC: -	**IC:** RSS-247 5.2(a)			
Maximum Peak Output Power	**FCC:** KDB 558074 D01 DTS Meas Guidance v04	**FCC:** Section 15.247(b)(3)		Complied c)	Conducted
	IC: RSS-Gen 6.12	**IC:** RSS-247 5.4(d)			
Power Density	**FCC:** KDB 558074 D01 DTS Meas Guidance v04	**FCC:** Section 15.247(e)		Complied d)	Conducted
	IC: -	**IC:** RSS-247 5.2(b)			
Spurious Emission Restricted Band Edges	**FCC:** KDB 558074 D01 DTS Meas Guidance v04	**FCC:** Section15.247(d)	1.6 dB 2483.500 MHz, PK, Vert. Tx 11n-40 2452 MHz, Antenna : 1001932FT	Complied# e) f)	Conducted (below 30 MHz)/ Radiated (above 30 MHz) *1)
	IC: RSS-Gen 6.13	**IC:** RSS-247 5.5 RSS-Gen 8.9 RSS-Gen 8.10			

Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422.
*1) Radiated test was selected over 30 MHz based on section 15.247(d) and KDB 558074 D01 DTS Meas Guidance v04 12.2.7.
*2) Since measurement was performed before issue of KDB 558074 v05r01, we referred to v04.
a) Refer to APPENDIX 1 (data of Conducted Emission)
b) Refer to APPENDIX 1 (data of 6 dB Bandwidth and 99 % Occupied Bandwidth)
c) Refer to APPENDIX 1 (data of Maximum Peak Output Power)
d) Refer to APPENDIX 1 (data of Power Density)
e) Refer to APPENDIX 1 (data of Conducted Spurious Emission)
f) Refer to APPENDIX 1 (data of Radiated Spurious Emission

Symbols:
Complied The data of this test item has enough margin, more than the measurement uncertainty.
Complied# The data of this test item meets the limits unless the measurement uncertainty is taken into consideration.

* In case any questions arise about test procedure, ANSI C63.10: 2013 is also referred.

FCC Part 15.31 (e)
This EUT provides stable voltage constantly to RF Module regardless of input voltage from host device. Therefore, this EUT complies with the requirement.

FCC Part 15.203 Antenna requirement
[WYSAGVDXG]
It is impossible for end users to replace the antenna, because it is soldered on the circuit board. Therefore the equipment complies with the requirement.

[WYSEGVDXG]
The EUT has a unique coupling/antenna connector. Therefore the equipment complies with the requirement.

3.3 Addition to standard

Item	Test Procedure	Specification	Worst margin	Results	Remarks
99% Occupied Bandwidth	**IC:** RSS-Gen 6.6	**IC:** -	N/A	- b)	Conducted
Note: UL Japan, Inc.'s EMI Work Procedures No. 13-EM-W0420 and 13-EM-W0422. b) Refer to APPENDIX 1 (data of 20dB Bandwidth, 99%Occupied Bandwidth and Carrier Frequency Separation)					

Other than above, no addition, exclusion nor deviation has been made from the standard.

3.4 Uncertainty

EMI

There is no applicable rule of uncertainty in this applied standard. Therefore, the following results are derived depending on whether or not laboratory uncertainty is applied.

The following uncertainties have been calculated to provide a confidence level of 95 % using a coverage factor *k*=2.

Shonan EMC Lab.

Item	Frequency range	Uncertainty (+/-)				
		No. 1 SAC / SR	No. 2 SAC / SR	No. 3 SAC / SR	No. 4 SAC / SR	No. 5,6,8 SR
Conducted emission (AC Mains) LISN	150 kHz-30 MHz	2.5 dB	2.5 dB	2.5 dB	2.6 dB	2.6 dB
Radiated emission (Measurement distance: 3 m)	9 kHz-30 MHz	3.2 dB	3.2 dB	3.3 dB	-	-
	30 MHz-200 MHz	4.9 dB	4.8 dB	4.9 dB	-	-
	200 MHz-1 GHz	6.1 dB	6.1 dB	6.1 dB	-	-
	1 GHz-6 GHz	4.7 dB	4.7 dB	4.7 dB	-	-
	6 GHz-18 GHz	5.3 dB	5.3 dB	5.3 dB	-	-
	18 GHz-40 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
Radiated emission (Measurement distance: 1 m)	1 GHz-18 GHz	5.6 dB	5.6 dB	5.6 dB	-	-
	18 GHz-40 GHz	5.9 dB	5.9 dB	5.9 dB	-	-

SAC=Semi-Anechoic Chamber
SR= Shielded Room is applied besides radiated emission

Antenna terminal test	Uncertainty (+/-)
Power Measurement above 1 GHz (Average Detector)_SPM-06	0.48 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-06	0.66 dB
Power Measurement above 1 GHz (Average Detector)_SPM-07	0.47 dB
Power Measurement above 1 GHz (Peak Detector)_SPM-07	0.64 dB
Spurious emission (Conducted) below 1GHz	1.8 dB
Spurious emission (Conducted) 1 GHz-3 GHz	1.7 dB
Spurious emission (Conducted) 3 GHz-18 GHz	2.5 dB
Spurious emission (Conducted) 18 GHz-26.5 GHz	2.5 dB
Spurious emission (Conducted) 26.5 GHz-40 GHz	2.7 dB
Bandwidth Measurement	1.01 %
Duty cycle and Time Measurement	0.012 %

3.5 Test Location

UL Japan, Inc. Shonan EMC Lab.
1-22-3, Megumigaoka, Hiratsuka-shi, Kanagawa-ken 259-1220 JAPAN
Telephone: +81 463 50 6400, Facsimile: +81 463 50 6401
JAB Accreditation No. RTL02610
FCC Test Firm Registration Number: 839876

Test site	IC Registration Number	Width x Depth x Height (m)	Size of reference ground plane (m) / horizontal conducting plane	Maximum measurement distance
No.1 Semi-anechoic chamber	2973D-1	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.2 Semi-anechoic chamber	2973D-2	20.6 x 11.3 x 7.65	20.6 x 11.3	10 m
No.3 Semi-anechoic chamber	2973D-3	12.7 x 7.7 x 5.35	12.7 x 7.7	5 m
No.4 Semi-anechoic chamber	-	8.1 x 5.1 x 3.55	8.1 x 5.1	-
No.1 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.2 Shielded room	-	6.8 x 4.1 x 2.7	6.8 x 4.1	-
No.3 Shielded room	-	6.3 x 4.7 x 2.7	6.3 x 4.7	-
No.4 Shielded room	-	4.4 x 4.7 x 2.7	4.4 x 4.7	-
No.5 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.6 Shielded room	-	7.8 x 6.4 x 2.7	7.8 x 6.4	-
No.8 shielded room	-	3.45 x 5.5 x 2.4	3.45 x 5.5	-
No.1 Measurement room	-	2.55 x 4.1 x 2.5	-	-

3.6 Test data, Test instruments, and Test set up

Refer to APPENDIX.

SECTION 4: Operation of E.U.T. during testing

4.1 Operating Mode(s)

Test operating mode was determined as follows according to "Section 1 of 6 802.11 a/b/g/n testing - Managing Complex Regulatory Approvals - " of TCB Council Workshop October 2009.

Mode	Remarks*
IEEE 802.11b (11b)	1 Mbps, PN9
IEEE 802.11g (11g)	6 Mbps, PN9
IEEE 802.11n MIMO 20 MHz BW (11n-20)	MCS 1, PN9
IEEE 802.11n MIMO 40 MHz BW (11n-40)	MCS 0, PN9
Bluetooth (BT) Low Energy (LE)	Maximum Packet Size, PN9
*The worst condition was determined based on the test result of Maximum Peak Output Power (Mid Channel)	
*Power of the EUT was set by the software as follows; Power settings: 11b/11g/11n-20 : 12 dBm 11n-40 : 10 dBm BT LE : 0 dBm Software: Dut labtool Version 2.0.0.96 *This setting of software is the worst case. Any conditions under the normal use do not exceed the condition of setting. In addition, end users cannot change the settings of the output power of the product.	

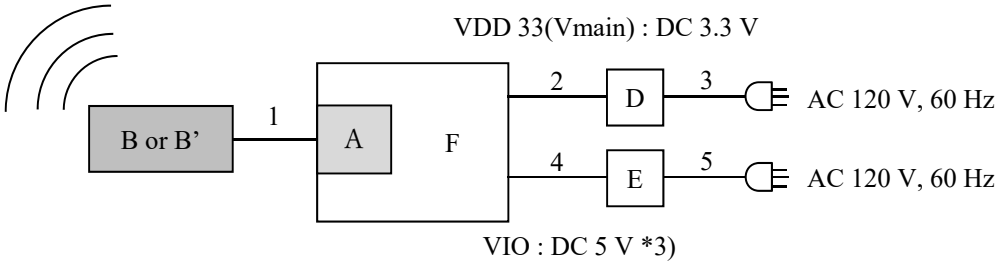
*The details of Operating mode(s)

Test Item	Operating Mode	Tested frequency
Conducted Emission *1) *2)	11n-20 Tx	2462 MHz
	BT LE	2402 MHz, 2440 MHz, 2480 MHz
Spurious Emission (Radiated) *4)	11b Tx 11g Tx 11n-20 Tx	2412 MHz, 2437 MHz, 2462 MHz
	11n-40 Tx	2422 MHz, 2437 MHz, 2452 MHz
	BT LE	2402 MHz, 2440 MHz, 2480 MHz
6dB Bandwidth Maximum Peak Output Power Power Density 99% Occupied Bandwidth *3)	11b Tx 11g Tx 11n-20 Tx	2412 MHz, 2437 MHz, 2462 MHz
	11n-40 Tx	2422 MHz, 2437 MHz, 2452 MHz
	BT LE	2402 MHz, 2440 MHz, 2480 MHz

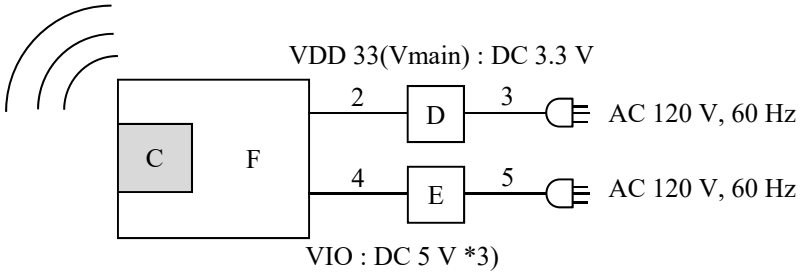
*1) The mode was tested as a representative, because it had the highest power at antenna terminal test.
*2) Conducted emission has been measured with WYSEGVDXG (Antenna: 1001932PT).
WYSEGVDXG (Antenna: 1001932FT) and WYSAGVDXG were confirmed with Peak chart only.
*3) Antenna terminal test has been measured with WYSEGVDXG as representative.
*4) Full measurement of Radiated emission in 30 MHz - 26.5 GHz has been performed with WYSEGVDXG (Antenna: 1001932 PT).
-WYSEGVDXG (Antenna: 1001932 FT) was tested at only 11n-20 Tx 2462 MHz and BT LE 2440 MHz in 30 MHz - 26.5 GHz, 11n-40 Tx 2422 MHz in 1 GHz - 26.5 GHz, and band edge measurement. Because the antennas 1001932 PT and 1001932 FT have the same antenna shape and gain, the difference is only the material of the base.
-WYSAGVDXG (Chip Antenna) was also tested at only 11n-20 Tx 2462 MHz and BT LE 2440 MHz in 30 MHz - 26.5 GHz, 11n-40 Tx 2422 MHz in 1 GHz - 26.5 GHz, and band edge measurement. Because it was confirmed by pretest that carrier and spurious emission were equivalent or less than WYSEGVDXG (Antenna: 1001932 PT).

4.2 Configuration and peripherals

External Antenna type



Chip Antenna type



* Cabling and setup(s) were taken into consideration and test data was taken under worse case conditions.

Description of EUT and Support equipment

No.	Item	Model number	Serial number	Manufacturer	Remark
A	Wireless LAN & Bluetooth Combo Module (External Antenna type)	WYSEGVDXG	TYWLAN-AC3FA 4001B79 *1) TYWLAN-AC3FA 4001B7D *2)	TAIYO YUDEN CO., LTD.	EUT
B	Tunable Embedded FPC Antenna	1001932PT	PT-AC3FA4001B7D	TAIYO YUDEN CO., LTD.	EUT
B'	Tunable Embedded FPC Antenna	1001932FT	FT-AC3FA4001B7D	TAIYO YUDEN CO., LTD.	EUT
C	Wireless LAN & Bluetooth Combo Module (Chip Antenna type)	WYSAGVDXG	TYWLAN-AC3FA 4001B7B *2)	TAIYO YUDEN CO., LTD.	EUT
D	Power Supply (DC)	PAN35-10A	DE001677	Kikusui	-
E	Power Supply (DC)	PAN60-10A	NL002383	Kikusui	-
F	Jig Board	-	-	TAIYO YUDEN CO., LTD.	-

*1) Used for Antenna Terminal conducted test
*2) Used for Conducted Emission test and Radiated Emission test
*3) VIO is converted to DC 3.3 V on Jig Board and supplied to EUT

List of cables used

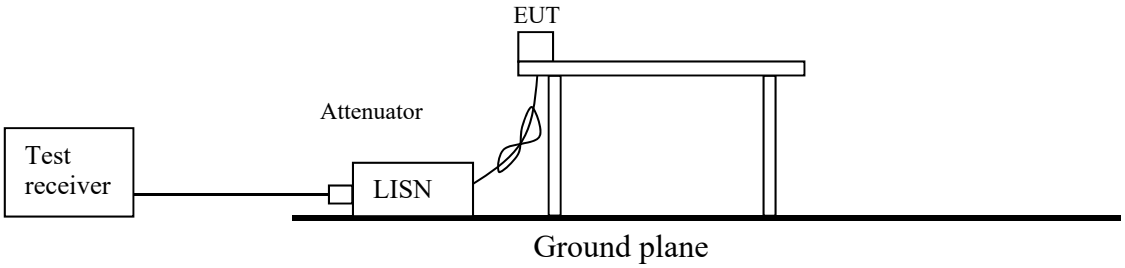
No.	Name	Length (m)	Shield		Remark
			Cable	Connector	
1	Antenna	0.1	Shielded	Shielded	-
2	DC	0.2 + 1.0	Unshielded	Unshielded	-
3	AC	3.0	Unshielded	Unshielded	-
4	DC	0.2 + 1.0	Unshielded	Unshielded	-
5	AC	3.0	Unshielded	Unshielded	-

SECTION 5: Conducted Emission

Test Procedure and conditions

EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane. The rear of tabletop was located 40 cm to the vertical conducting plane. The rear of EUT, including peripherals aligned and flushed with rear of tabletop. All other surfaces of tabletop were at least 80cm from any other grounded conducting surface. EUT was located 80 cm from a Line Impedance Stabilization Network (LISN) / Artificial mains Network (AMN) and excess AC cable was bundled in center.

Conducted emission



For the tests on EUT with other peripherals (as a whole system)
I/O cables that were connected to the peripherals were bundled in center. They were folded back and forth forming a bundle 30 cm to 40 cm long and were hanged at a 40 cm height to the ground plane. All unused 50ohm connectors of the LISN (AMN) were resistivity terminated in 50 ohm when not connected to the measuring equipment.

The AC Mains Terminal Continuous disturbance Voltage has been measured with the EUT in a Shielded room.
The EUT was connected to a LISN (AMN) via DC power source.
An overview sweep with peak detection has been performed.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Detector : QP and CISPR AV
Measurement range : 0.15 MHz - 30 MHz
Test data : APPENDIX
Test result : Pass

SECTION 6: Radiated Spurious Emission

Test Procedure

It was measured based on "11.0 Emissions in non-restricted frequency bands" of "KDB 558074 D01 DTS Meas Guidance v04".

[For below 1 GHz]
(Antenna:1001932PT, 1001932FT)
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 0.8 m above the conducting ground plane.

(Antenna:AH104N2450D1)
EUT was placed on a platform of nominal size, 1.0 m by 1.5 m, raised 0.8 m above the conducting ground plane.
The table is made of expanded polystyrol and expanded polypropylene and the table top is covered with polycarbonate. That has very low permittivity.

The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with a ground plane.

[For above 1 GHz]
EUT was placed on a urethane platform of nominal size, 0.5 m by 0.5 m, raised 1.5 m above the conducting ground plane.
The Radiated Electric Field Strength has been measured in a Semi Anechoic Chamber with absorbent materials lined on a ground plane.

The height of the measuring antenna varied between 1 and 4 m and EUT was rotated a full revolution in order to obtain the maximum value of the electric field strength.
The measurements were performed for both vertical and horizontal antenna polarization with the Test Receiver, or the Spectrum Analyzer.
The measurements were made with the following detector function of the test receiver and the Spectrum analyzer (in linear mode).
The test was made with the detector (RBW/VBW) in the following table.
When using Spectrum analyzer, the test was made with adjusting span to zero by using peak hold.

Test Antennas are used as below;

Frequency	30 MHz to 200 MHz	200 MHz to 1 GHz	Above 1 GHz
Antenna Type	Biconical	Logperiodic	Horn

In any 100 kHz bandwidth outside the restricted band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator confirmed 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on a radiated measurement.

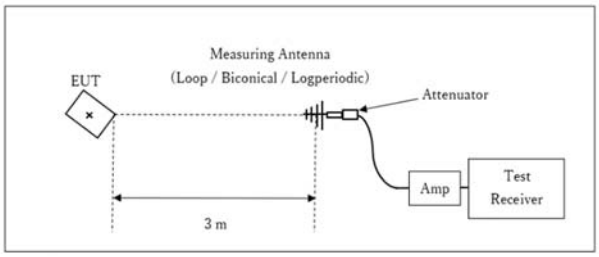
20 dBc was applied to the frequency over the limit of FCC 15.209 / Table 4 of RSS-Gen 8.9(IC) and outside the restricted band of FCC15.205 / Table 6 of RSS-Gen 8.10 (IC).

Frequency	Below 1 GHz	Above 1 GHz		20 dBc
Instrument used	Test Receiver	Spectrum Analyzer		Spectrum Analyzer
Detector	QP	PK	AV *1)	PK
IF Bandwidth	BW 120 kHz	RBW: 1 MHz VBW: 3 MHz	RBW: 1 MHz VBW: 3 MHz Detector: Power Averaging (RMS) Trace: 100 traces If duty cycle was less than 98%, a duty factor was added to the results.	RBW: 100 kHz VBW: 300 kHz

*1) Average Power Measurement was performed based on 6. 0 & 12.2.5 of "KDB 558074 D01 DTS Meas Guidance v04".

Radiated emission

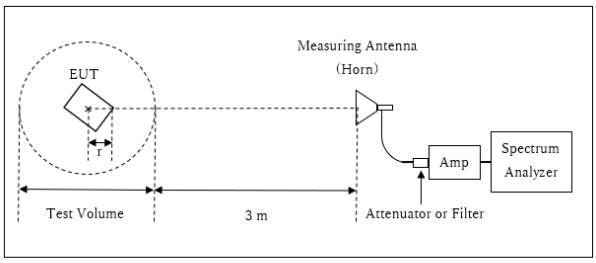
Below 1 GHz



× : Center of turn table

Test Distance: 3 m

1 GHz - 13 GHz



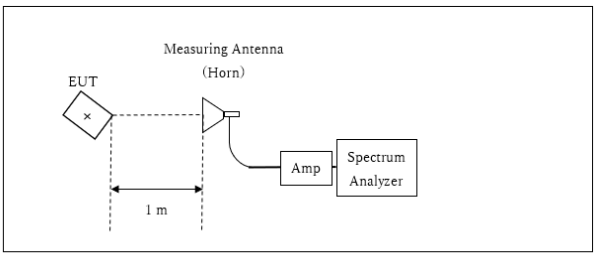
r : Radius of an outer periphery of EUT
× : Center of turn table

External Antenna type
Distance Factor: 20 x log (3.92 m*/3.0 m) = 2.33 dB
* Test Distance: (3 + Test Volume /2) - r = 3.92 m

Chip Antenna type
Distance Factor: 20 x log (3.95 m*/3.0 m) = 2.39 dB
* Test Distance: (3 + Test Volume /2) - r = 3.95 m

Test Volume: 2 m
(Test Volume has been calibrated based on CISPR 16-1-4.)
r = 0.08 m (External Antenna type)
r = 0.05 m (Chip Antenna type)

13 GHz - 26.5 GHz



× : Center of turn table

Distance Factor: 20 x log (1.0 m* / 3.0 m) = -9.54 dB
*Test Distance: 1 m

- The carrier level and noise levels were confirmed at each position of X, Y and Z axes of EUT to see the position of maximum noise, and the test was made at the position that has the maximum noise.

The test results and limit are rounded off to one decimal place, so some differences might be observed.

Measurement range : 30 MHz - 26.5 GHz
Test data : APPENDIX
Test result : Pass

SECTION 7: Antenna Terminal Conducted Tests

Test Procedure

The tests were made with below setting connected to the antenna port.

Test	Span	RBW	VBW	Sweep time	Detector	Trace	Instrument used
6dB Bandwidth	50 MHz for IEEE 802.11b,g,n-20 100 MHz for IEEE 802.11n-40 10 MHz for BT LE	100 kHz	300 kHz	Auto	Peak	Max Hold	Spectrum Analyzer
99% Occupied Bandwidth *1)	Enough width to display emission skirts	1 to 5 % of OBW	Three times of RBW	Auto	Peak	Max Hold	Spectrum Analyzer
Maximum Peak Output Power	-	-	-	Auto	Peak/ Average *2)	-	Power Meter (Sensor: 160 MHz BW)
Peak Power Density	1.5 times the 6 dB Bandwidth	3 kHz	9.1 kHz	Auto	Peak	Max Hold	Spectrum Analyzer *3)
Conducted Spurious Emission *4)	9 kHz to 150 kHz	200 Hz	620 Hz	Auto	Peak	Max Hold	Spectrum Analyzer
	150 kHz to 30 MHz	10 kHz	30 kHz				

*1) Peak hold was applied as Worst-case measurement.
*2) Reference data
*3) Section 10.2 Method PKPSD (peak PSD) of "KDB 558074 D01 DTS Meas Guidance v04".
*4) In the frequency range below 30MHz, RBW was narrowed to separate the noise contents.
Then, wide-band noise near the limit was checked separately, however the noise was not detected as shown in the chart.
(9 kHz - 150 kHz: RBW = 200 Hz, 150 kHz - 30 MHz: RBW = 10 kHz)

The test results and limit are rounded off to two decimals place, so some differences might be observed.

Test data : APPENDIX
Test result : Pass

APPENDIX 1: Test data

Conducted Emission

Antenna: External Antenna (1001932PT)
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

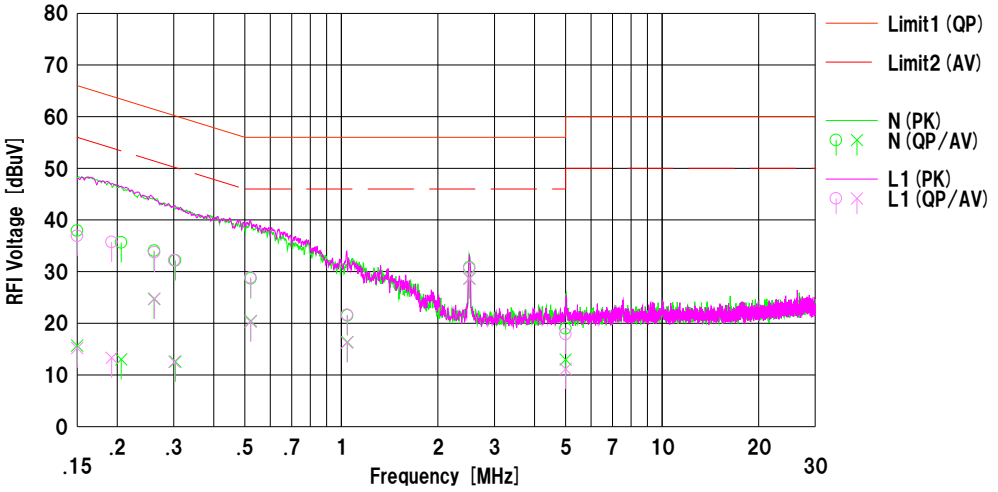
Mode : Tx 11n-20 2462 MHz

Power : DC 3.3 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : Vmain
Ant : 1001932PT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda



No.	Freq.	Reading <QP> [dBuV]	Reading <AV> [dBuV]	C.Fac [dB]	Results <QP> [dBuV]	Results <AV> [dBuV]	Limit <QP> [dBuV]	Limit <AV> [dBuV]	Margin <QP> [dB]	Margin <AV> [dB]	Phase	Comment
1	0.15000	25.57	3.31	12.38	37.95	15.69	66.00	56.00	28.0	40.3	N	
2	0.20600	23.27	0.64	12.38	35.65	13.02	63.37	53.37	27.7	40.3	N	
3	0.26073	21.67	12.30	12.40	34.07	24.70	61.41	51.41	27.3	26.7	N	
4	0.30383	19.75	0.15	12.41	32.16	12.56	60.14	50.14	27.9	37.5	N	
5	0.52204	16.27	8.04	12.41	28.68	20.45	56.00	46.00	27.3	25.5	N	
6	1.04464	9.04	3.89	12.47	21.51	16.36	56.00	46.00	34.4	29.6	N	
7	2.50664	18.29	16.17	12.54	30.83	28.71	56.00	46.00	25.1	17.2	N	
8	4.99956	6.32	0.31	12.67	18.99	12.98	56.00	46.00	37.0	33.0	N	
9	0.15000	24.54	2.83	12.38	36.92	15.21	66.00	56.00	29.0	40.7	L1	
10	0.19220	23.34	0.94	12.39	35.73	13.33	63.94	53.94	28.2	40.6	L1	
11	0.26108	21.35	12.38	12.40	33.75	24.78	61.40	51.40	27.6	26.6	L1	
12	0.30161	19.78	0.14	12.41	32.19	12.55	60.20	50.20	28.0	37.6	L1	
13	0.52124	16.45	7.88	12.41	28.86	20.29	56.00	46.00	27.1	25.7	L1	
14	1.04188	9.16	3.79	12.47	21.63	16.26	56.00	46.00	34.3	29.7	L1	
15	2.50684	18.11	16.04	12.54	30.65	28.58	56.00	46.00	25.3	17.4	L1	
16	4.99981	5.23	-1.52	12.67	17.90	11.15	56.00	46.00	38.1	34.8	L1	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932PT)
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

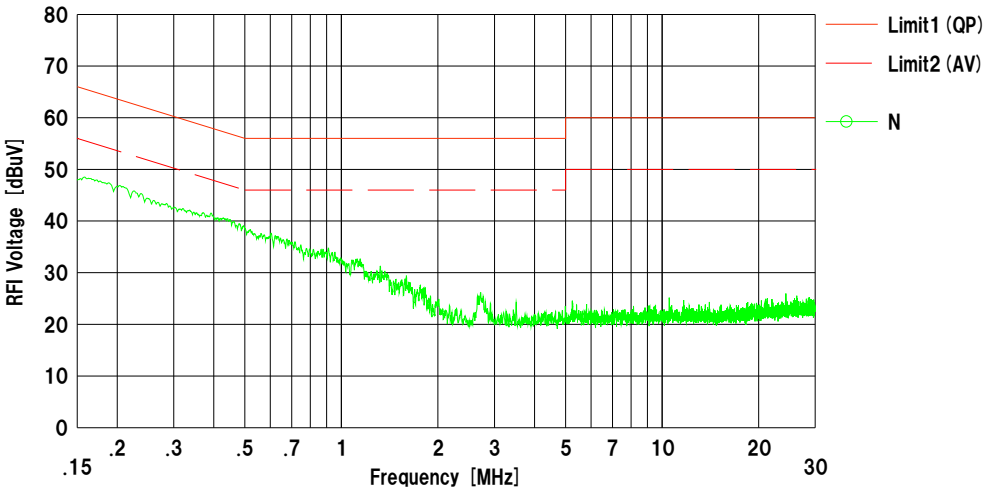
Mode : Tx BTLE 2402 MHz

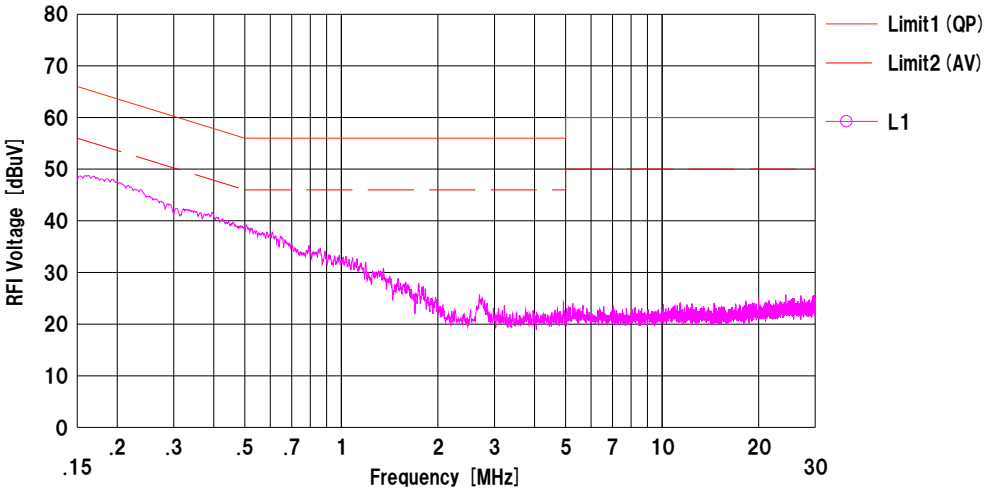
Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH

Remarks : Vmain
Ant : 1001932PT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932PT)
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

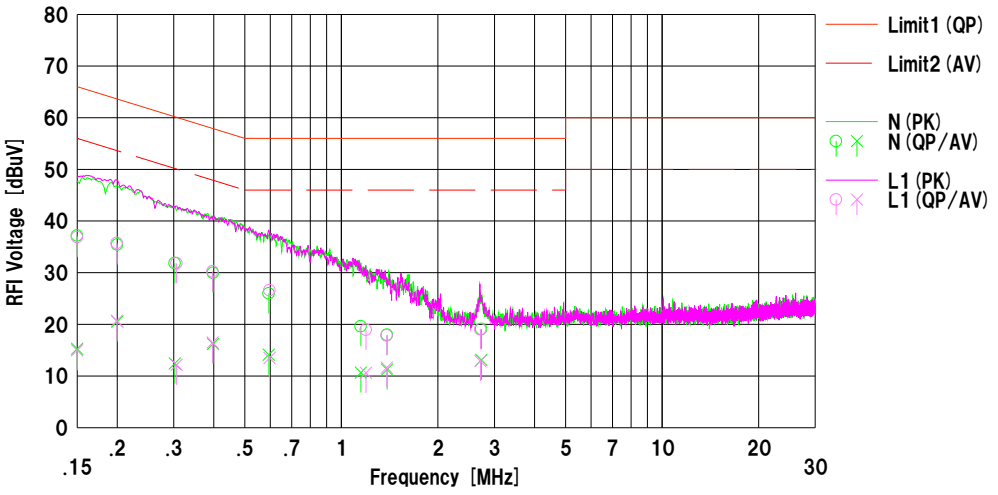
Mode : Tx BTLE 2440 MHz

Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH

Remarks : Vmain
Ant : 1001932PT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda



No.	Freq.	Reading <QP>	Reading <AV>	C.Fac	Results <QP>	Results <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	24.81	2.89	12.38	37.19	15.27	66.00	56.00	28.8	40.7	N	
2	0.20016	23.05	8.16	12.38	35.43	20.54	63.60	53.60	28.1	33.0	N	
3	0.30256	19.42	0.02	12.41	31.83	12.43	60.17	50.17	28.3	37.7	N	
4	0.39814	17.53	3.78	12.43	29.96	16.21	57.89	47.89	27.9	31.6	N	
5	0.59394	13.54	1.66	12.45	25.99	14.11	56.00	46.00	30.0	31.8	N	
6	1.15040	7.12	-1.84	12.49	19.61	10.65	56.00	46.00	36.3	35.3	N	
7	1.38851	5.48	-1.24	12.49	17.97	11.25	56.00	46.00	38.0	34.7	N	
8	2.73092	6.56	0.55	12.55	19.11	13.10	56.00	46.00	36.8	32.9	N	
9	0.15000	24.50	2.58	12.38	36.88	14.96	66.00	56.00	29.1	41.0	L1	
10	0.19952	23.36	8.32	12.38	35.74	20.70	63.63	53.63	27.8	32.9	L1	
11	0.30654	19.41	-0.26	12.41	31.82	12.15	60.06	50.06	28.2	37.9	L1	
12	0.39682	17.82	4.05	12.43	30.25	16.48	57.92	47.92	27.6	31.4	L1	
13	0.59715	14.14	1.03	12.45	26.59	13.48	56.00	46.00	29.4	32.5	L1	
14	1.19251	6.44	-1.88	12.49	18.93	10.61	56.00	46.00	37.0	35.3	L1	
15	1.38534	5.34	-0.88	12.49	17.83	11.61	56.00	46.00	38.1	34.3	L1	
16	2.71330	6.48	0.35	12.55	19.03	12.90	56.00	46.00	36.9	33.1	L1	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932PT)
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

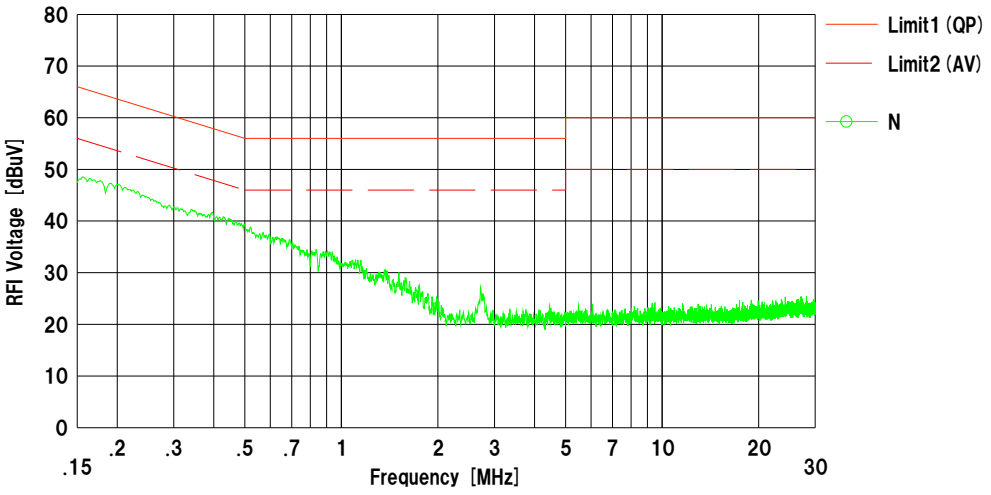
Mode : Tx BTLE 2480 MHz

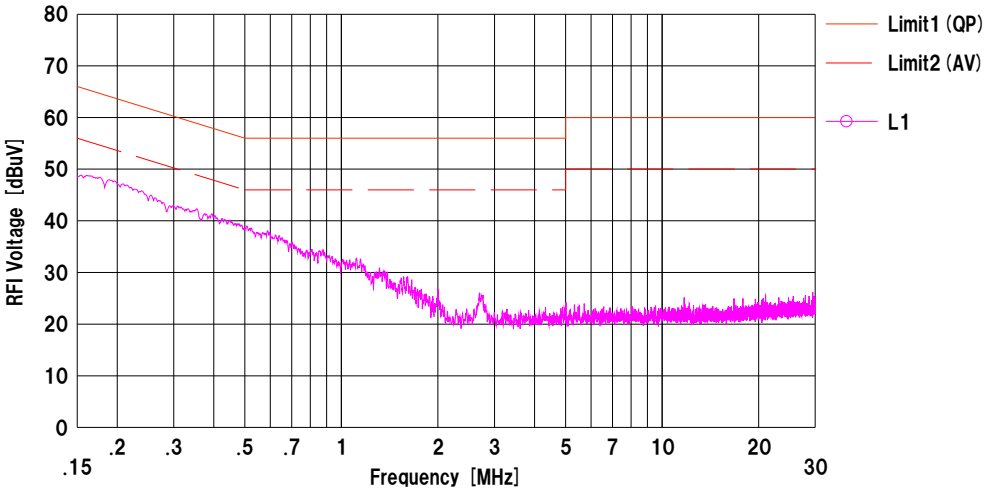
Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH

Remarks : Vmain
Ant : 1001932PT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932PT)
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

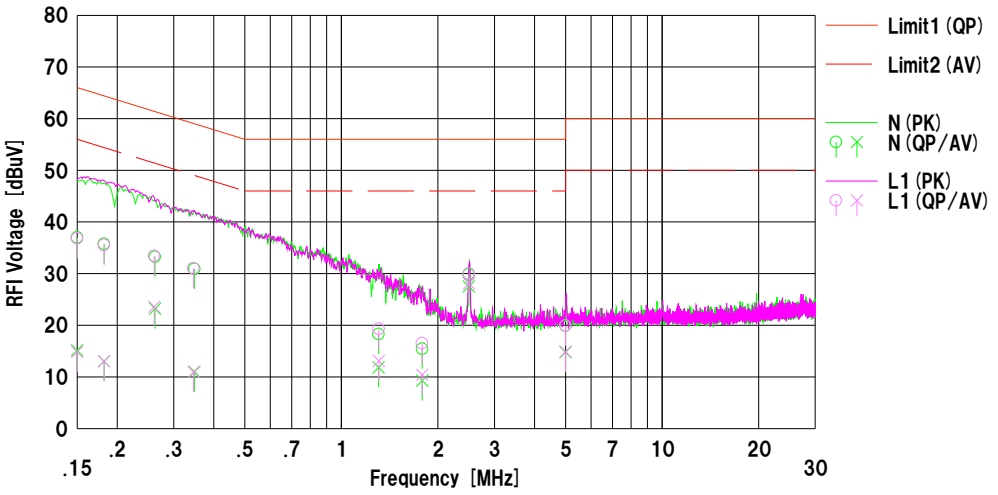
Mode : Tx 11n-20 2462 MHz

Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932PT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda



No.	Freq.	Reading <QP> [dBuV]	Reading <AV> [dBuV]	C.Fac [dB]	Results <QP> [dBuV]	Results <AV> [dBuV]	Limit <QP> [dBuV]	Limit <AV> [dBuV]	Margin <QP> [dB]	Margin <AV> [dB]	Phase	Comment
1	0.15000	24.63	2.78	12.38	37.01	15.16	66.00	56.00	28.9	40.8	N	
2	0.18207	23.38	0.64	12.39	35.77	13.03	64.39	54.39	28.6	41.3	N	
3	0.26254	20.84	10.81	12.40	33.24	23.21	61.35	51.35	28.1	28.1	N	
4	0.34825	18.48	-1.41	12.41	30.89	11.00	59.00	49.00	28.1	38.0	N	
5	1.30656	5.81	-0.64	12.48	18.29	11.84	56.00	46.00	37.7	34.1	N	
6	1.78691	2.92	-3.21	12.50	15.42	9.29	56.00	46.00	40.5	36.7	N	
7	2.49601	17.29	14.99	12.54	29.83	27.53	56.00	46.00	26.1	18.4	N	
8	4.99551	7.23	2.11	12.67	19.90	14.78	56.00	46.00	36.1	31.2	N	
9	0.15000	24.42	2.45	12.38	36.80	14.83	66.00	56.00	29.2	41.1	L1	
10	0.18201	23.15	0.65	12.39	35.54	13.04	64.39	54.39	28.8	41.3	L1	
11	0.26095	21.05	11.18	12.40	33.45	23.58	61.40	51.40	27.9	27.8	L1	
12	0.34612	18.62	-1.45	12.41	31.03	10.96	59.06	49.06	28.0	38.1	L1	
13	1.30824	6.81	0.63	12.48	19.29	13.11	56.00	46.00	36.7	32.8	L1	
14	1.78601	4.01	-2.09	12.50	16.51	10.41	56.00	46.00	39.4	35.5	L1	
15	2.50003	17.46	15.53	12.54	30.00	28.07	56.00	46.00	26.0	17.9	L1	
16	4.99727	7.26	2.21	12.67	19.93	14.88	56.00	46.00	36.0	31.1	L1	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932PT)
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

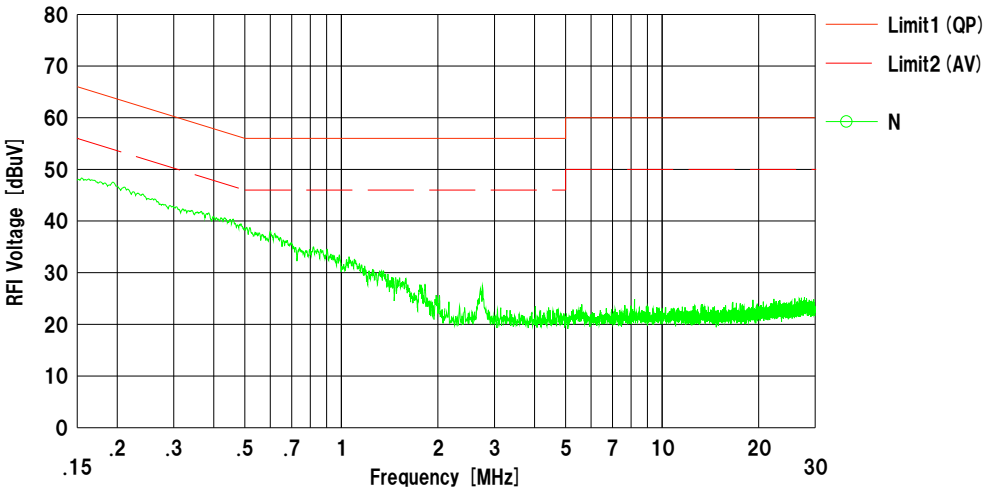
Mode : Tx BTLE 2402 MHz

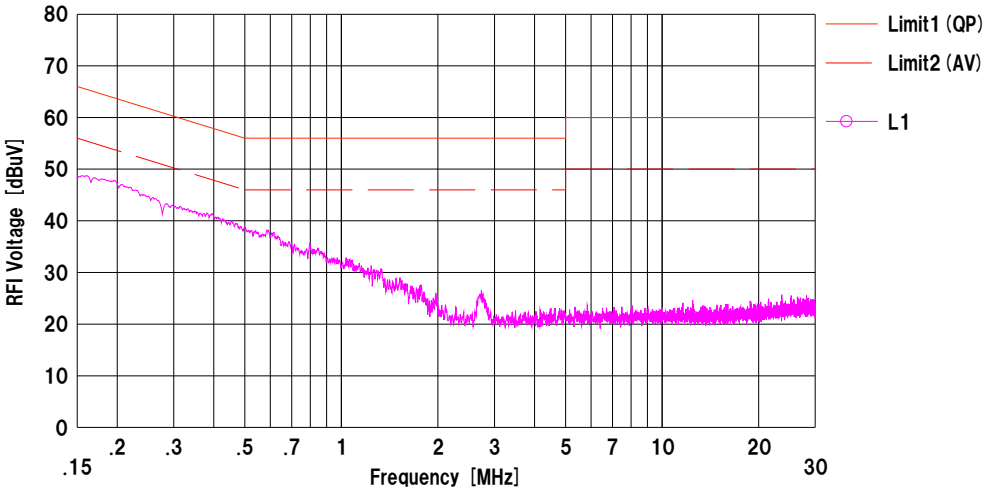
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932PT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932PT)
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

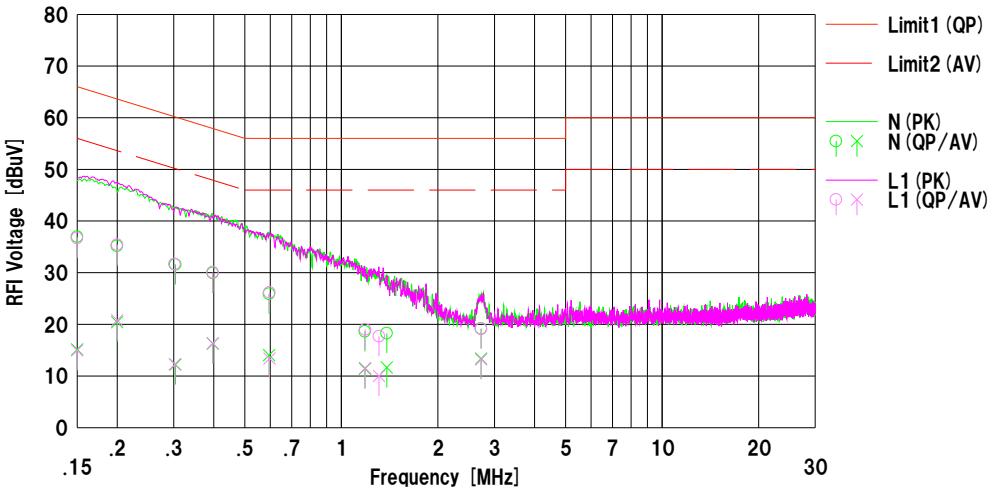
Mode : Tx BTLE 2440 MHz

Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932PT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda



No.	Freq.	Reading <QP>	Reading <AV>	C.Fac	Results <QP>	Results <AV>	Limit <QP>	Limit <AV>	Margin <QP>	Margin <AV>	Phase	Comment
	[MHz]	[dBuV]	[dBuV]	[dB]	[dBuV]	[dBuV]	[dBuV]	[dBuV]	[dB]	[dB]		
1	0.15000	24.58	2.75	12.38	36.96	15.13	66.00	56.00	29.0	40.8	N	
2	0.19984	22.81	8.04	12.38	35.19	20.42	63.62	53.62	28.4	33.2	N	
3	0.30396	19.18	-0.19	12.41	31.59	12.22	60.13	50.13	28.5	37.9	N	
4	0.39744	17.51	3.84	12.43	29.94	16.27	57.91	47.91	27.9	31.6	N	
5	0.59524	13.45	1.57	12.45	25.90	14.02	56.00	46.00	30.1	31.9	N	
6	1.18393	6.13	-1.08	12.49	18.62	11.41	56.00	46.00	37.3	34.5	N	
7	1.38518	5.78	-0.84	12.49	18.27	11.65	56.00	46.00	37.7	34.3	N	
8	2.72517	6.64	0.83	12.55	19.19	13.38	56.00	46.00	36.8	32.6	N	
9	0.15000	24.31	2.56	12.38	36.69	14.94	66.00	56.00	29.3	41.0	L1	
10	0.20006	23.04	8.41	12.38	35.42	20.79	63.61	53.61	28.1	32.8	L1	
11	0.30216	19.27	-0.15	12.41	31.68	12.26	60.18	50.18	28.5	37.9	L1	
12	0.39722	17.65	3.92	12.43	30.08	16.35	57.91	47.91	27.8	31.5	L1	
13	0.59736	13.73	0.92	12.45	26.18	13.37	56.00	46.00	29.8	32.6	L1	
14	1.18619	6.49	-0.95	12.49	18.98	11.54	56.00	46.00	37.0	34.4	L1	
15	1.31055	5.21	-2.48	12.48	17.69	10.00	56.00	46.00	38.3	36.0	L1	
16	2.72750	6.57	0.64	12.55	19.12	13.19	56.00	46.00	36.8	32.8	L1	

Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932PT)
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

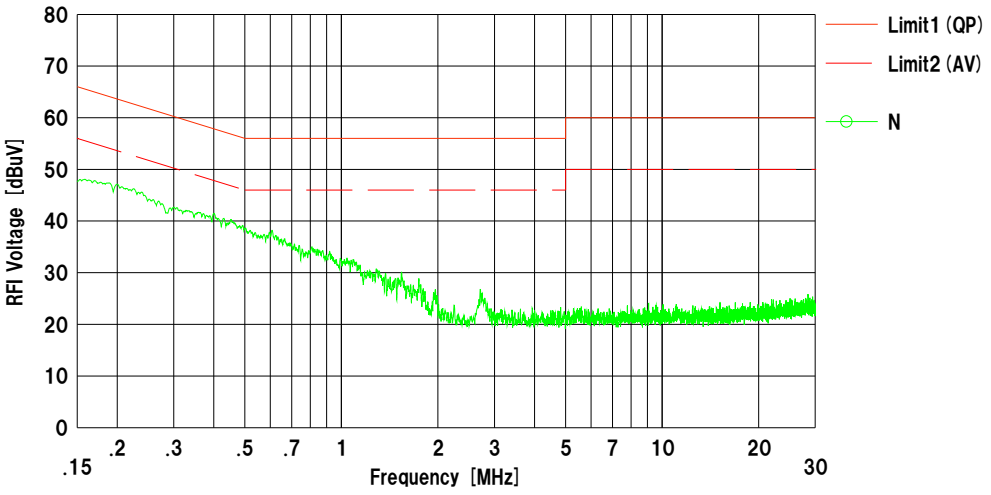
Mode : Tx BTLE 2480 MHz

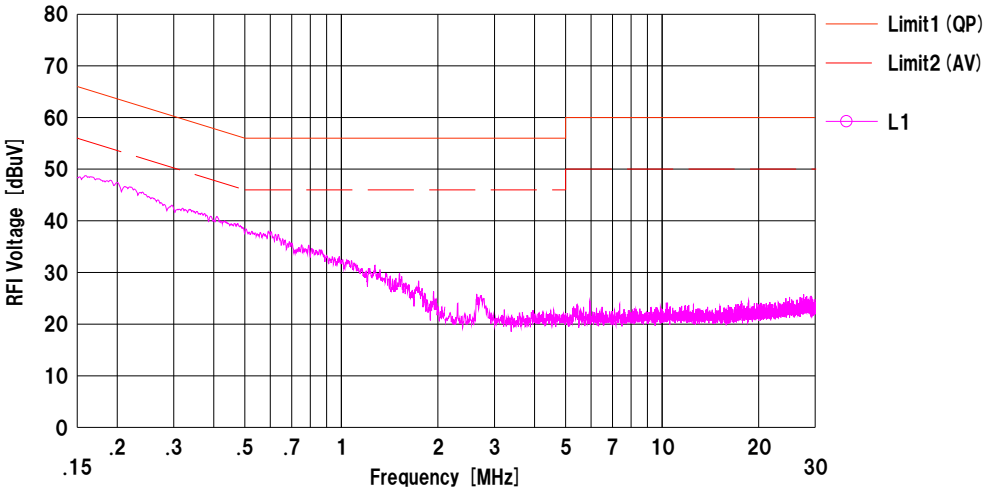
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932PT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932FT)
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

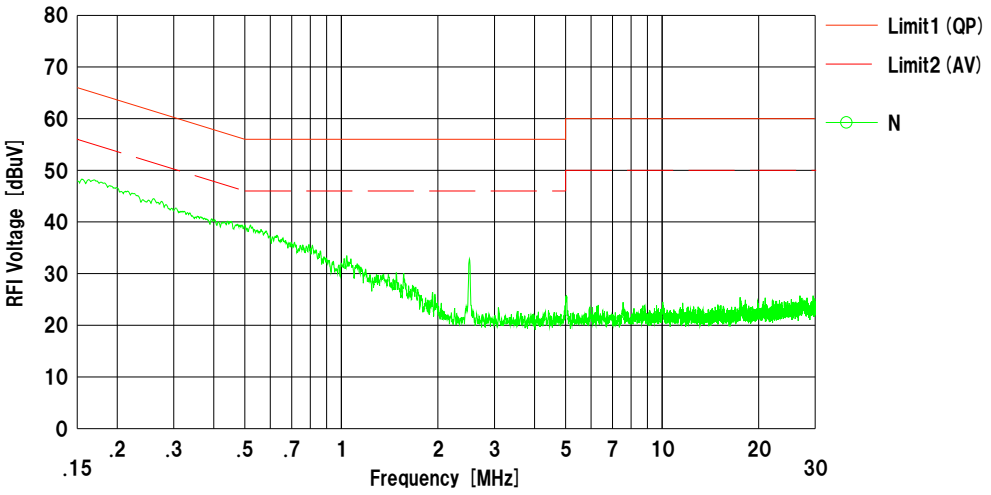
Mode : Tx 11n-20 2462 MHz

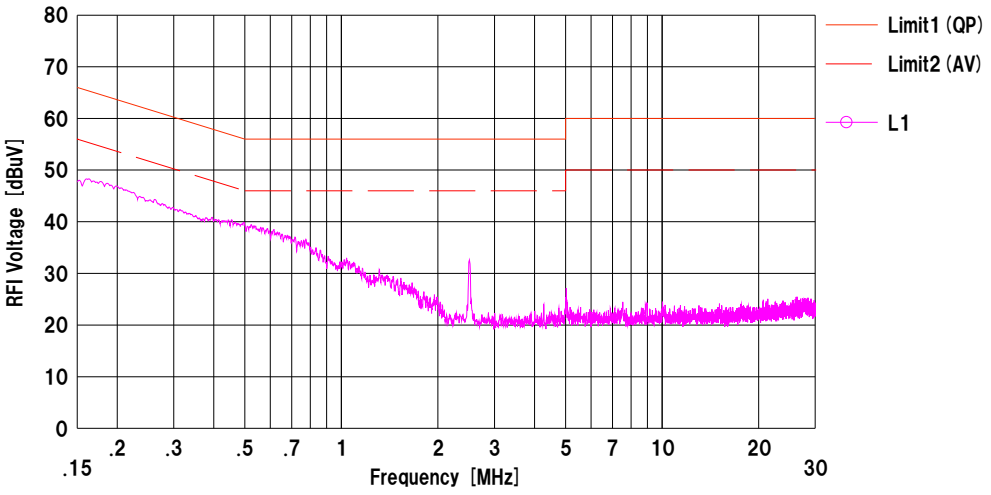
Power : DC 3.3 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : Vmain
Ant : 1001932FT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932FT)
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/27

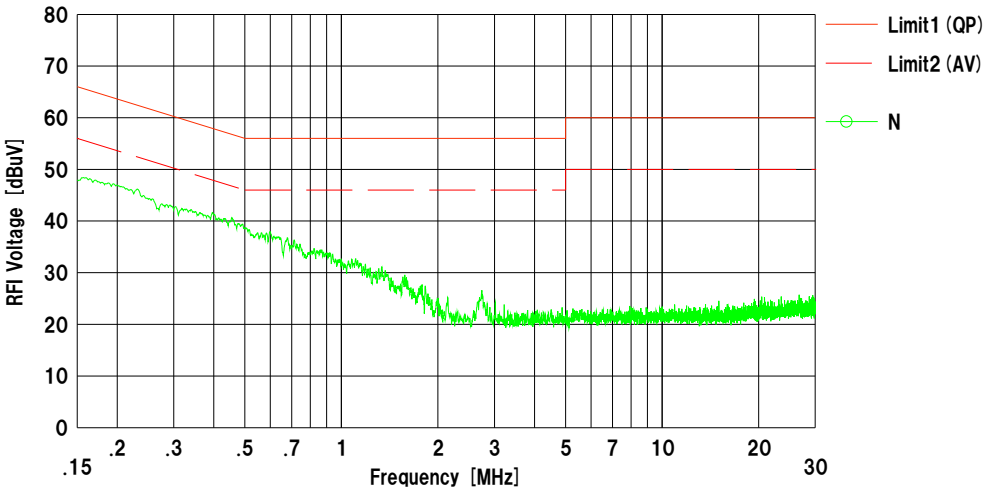
Mode : Tx BTLE 2440 MHz

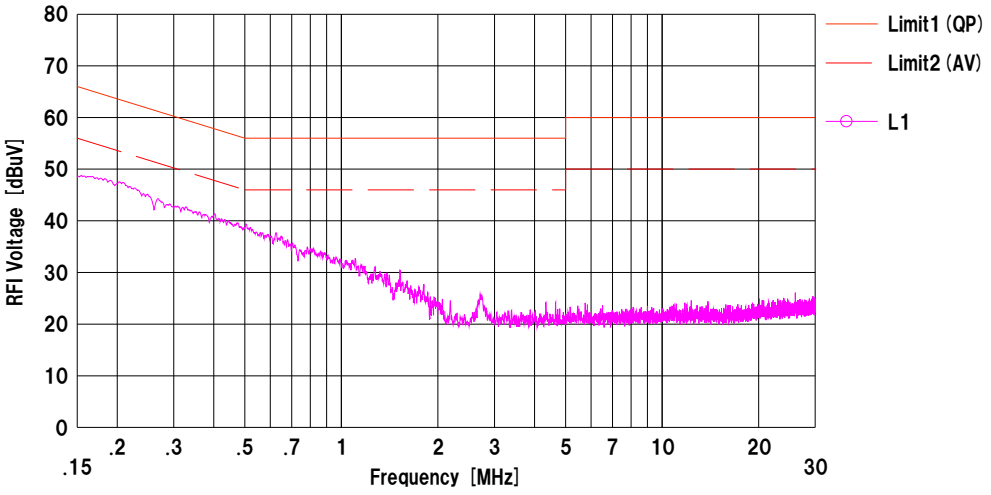
Power : DC 3.3 V
Temp./Humi. : 24 deg.C / 51 %RH

Remarks : Vmain
Ant : 1001932FT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932FT)
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

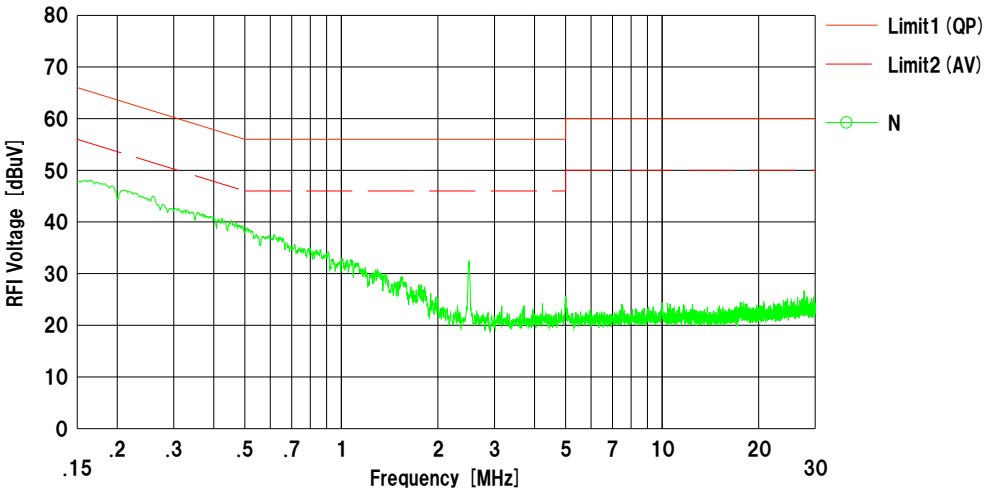
Mode : Tx 11-20 2462 MHz

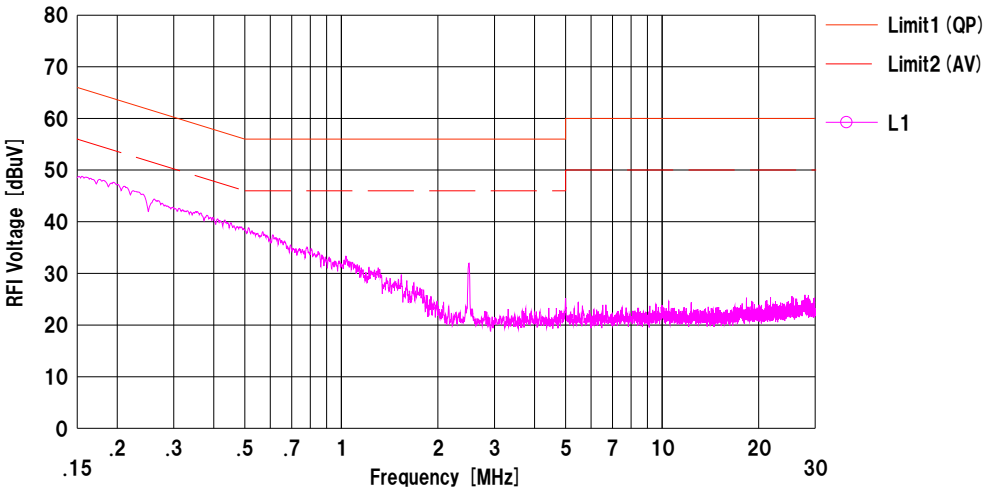
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932FT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: External Antenna (1001932FT)
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/24

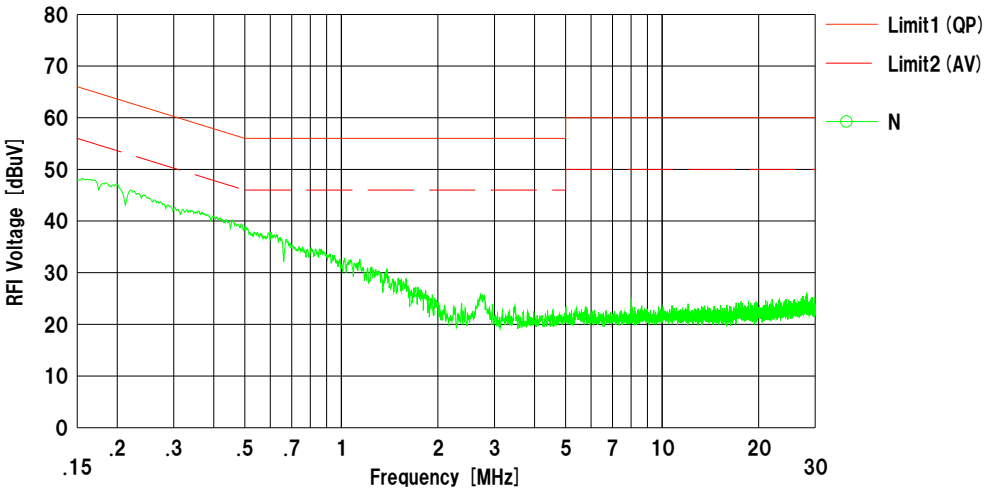
Mode : Tx BTLE 2440 MHz

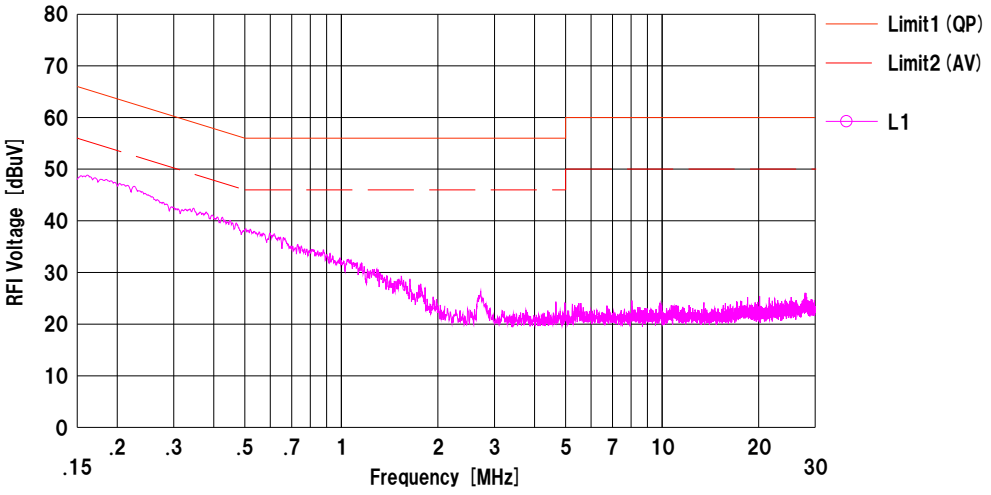
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO
Ant : 1001932FT

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: Chip Antenna
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

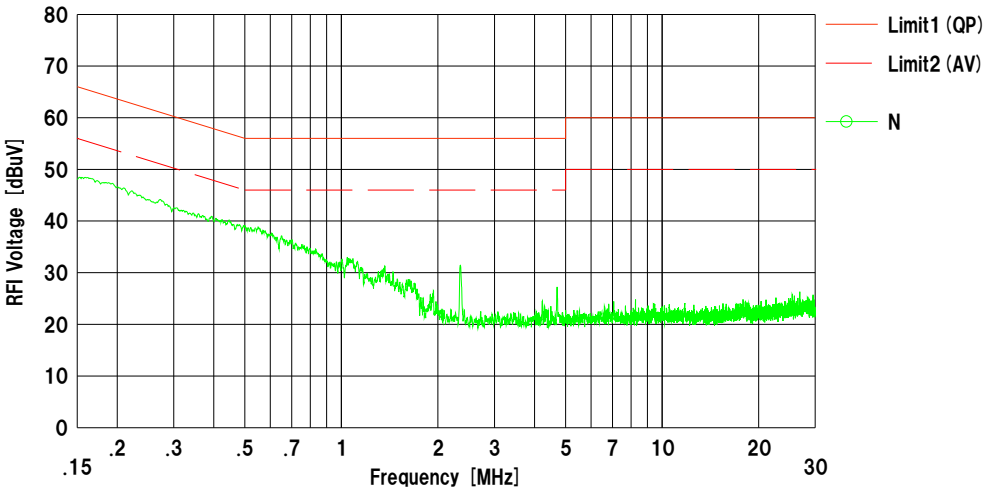
Mode : Tx 11-20 2462 MHz

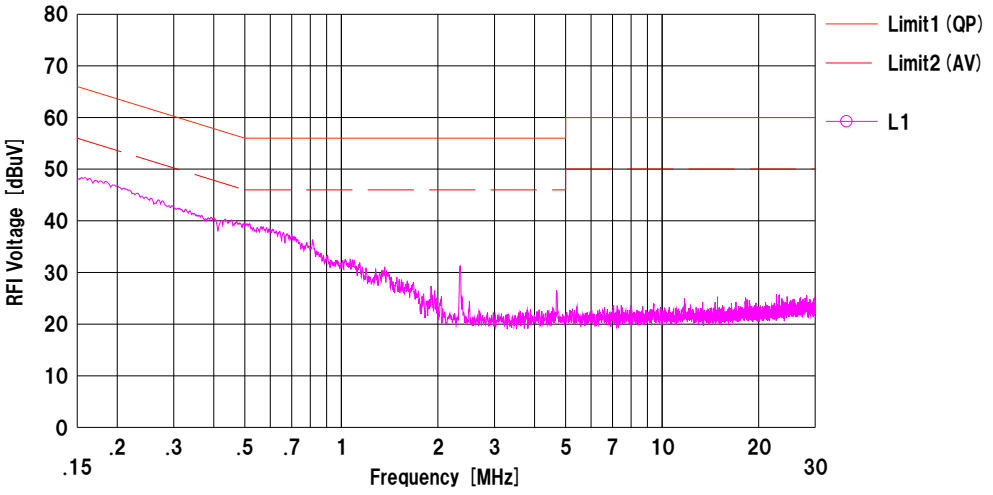
Power : DC 3.3 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : Vmain

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: Chip Antenna
Test Point: Vmain

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

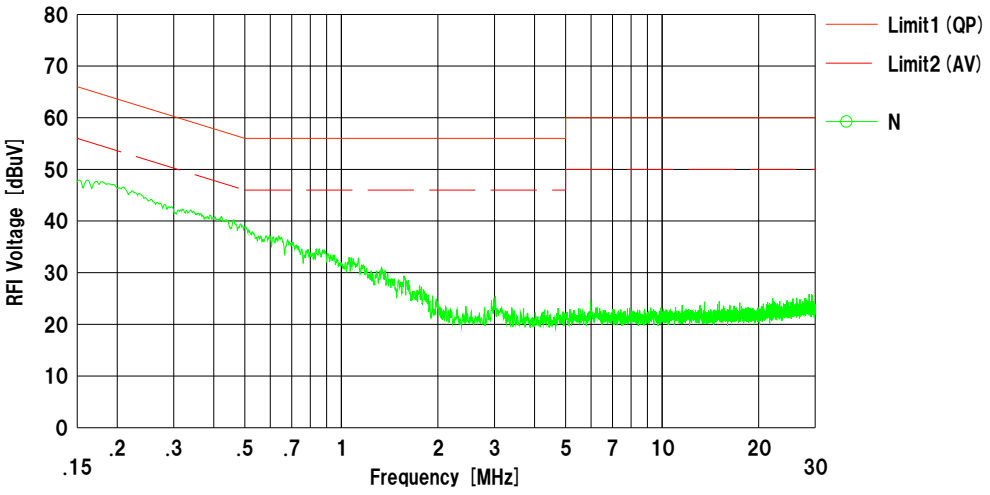
Mode : Tx BTLE 2440 MHz

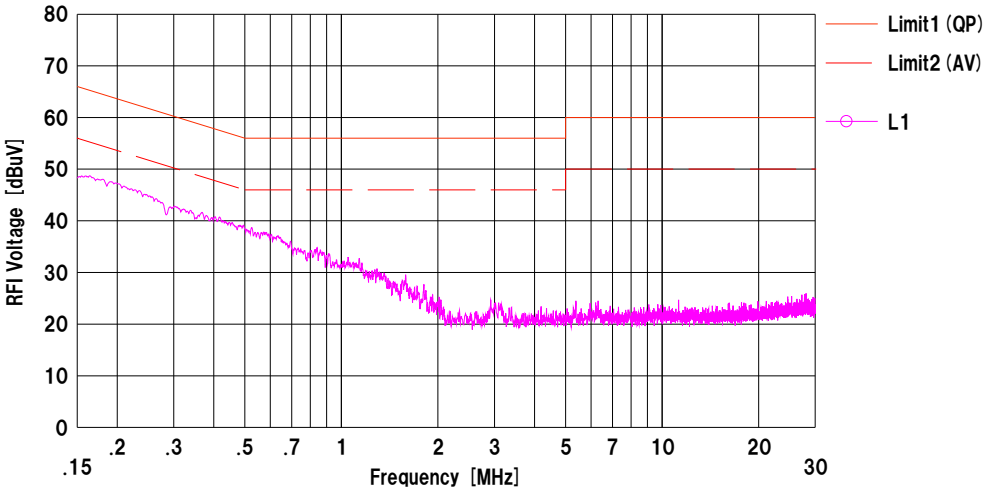
Power : DC 3.3 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : Vmain

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: Chip Antenna
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

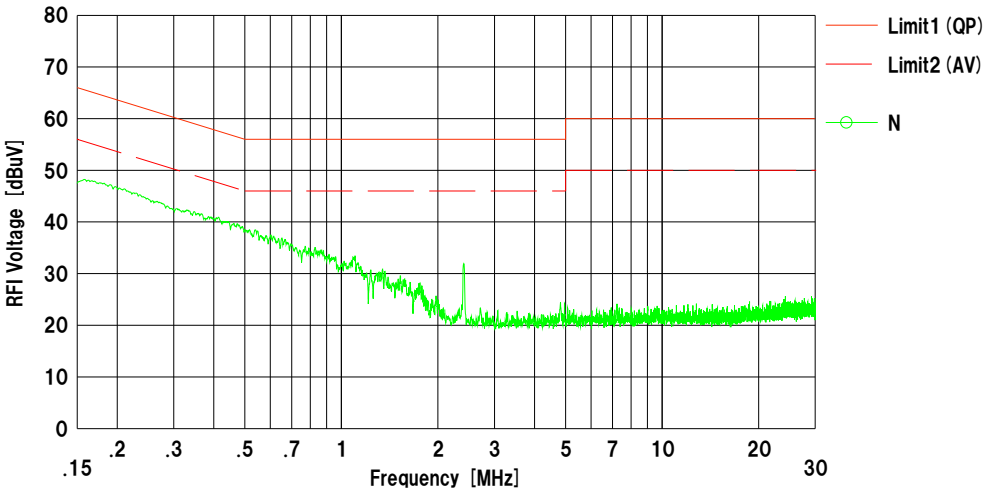
Mode : Tx 11-20 2462 MHz

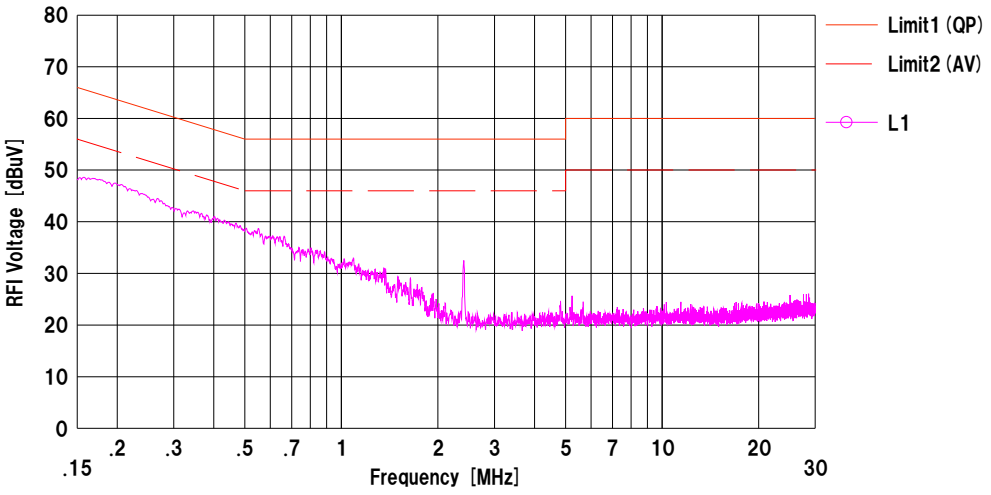
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

Conducted Emission

Antenna: Chip Antenna
Test Point: VIO

DATA OF CONDUCTED EMISSION TEST

UL Japan,Inc. Shonan EMC Lab. No.3 Shielded Room
Date : 2018/04/25

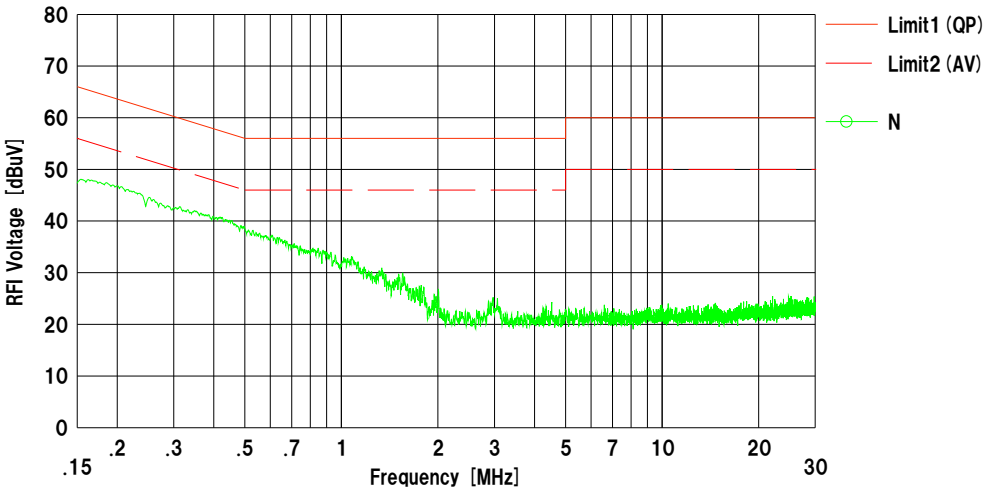
Mode : Tx BTLE 2440 MHz

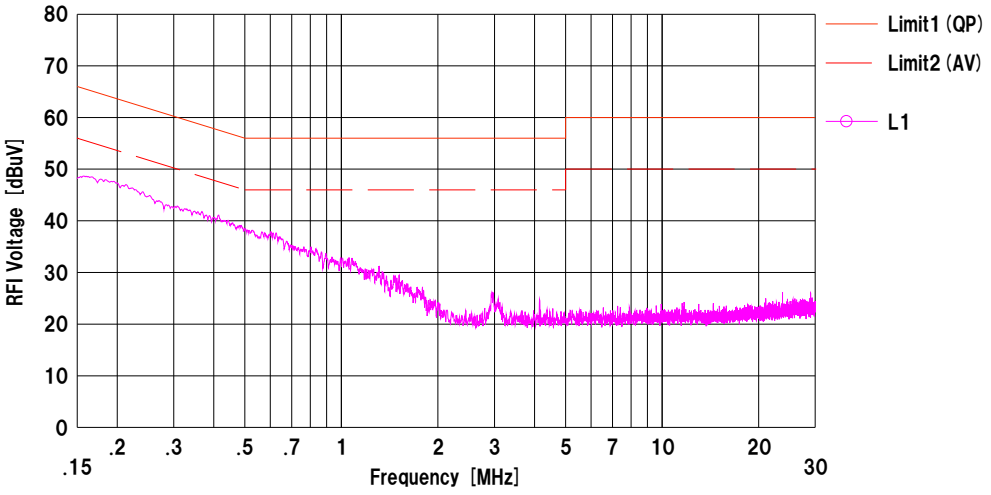
Power : DC 5 V
Temp./Humi. : 23 deg.C / 44 %RH

Remarks : VIO

Limit1 : FCC 15C (15.207) QP
Limit2 : FCC 15C (15.207) AV

Engineer : Kazuya Noda





Calculation:Result [dBuV] =Reading [dBuV] +C.Fac (LISN (AMN) +Cable+ATT) [dB]
LISN (AMN) : SLS-05

6 dB Bandwidth and 99 % Occupied Bandwidth

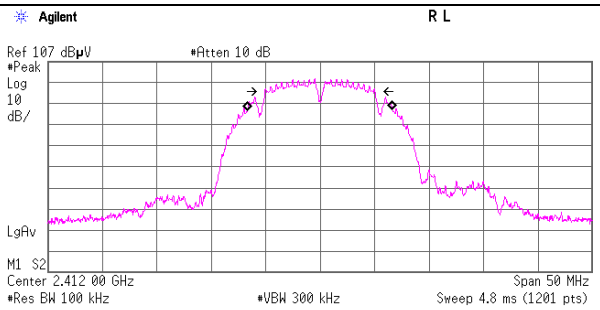
Test place	Shonan EMC Lab.		
	No.1 Measurement Room	No.5 Shielded Room	No.5 Shielded Room
Report No.	12193629S-A-R2		
Date	March 30, 2018	April 9, 2018	April 11, 2018
Temperature / Humidity	24 deg. C / 35 % RH	22 deg. C / 35 % RH	25 deg. C / 32 % RH
Engineer	Kazuya Noda	Kazuya Noda	Kazuya Noda
Mode	Tx		

Mode	Frequency [MHz]	99% Occupied Bandwidth [kHz]	6dB Bandwidth [MHz]	Limit for 6dB Bandwidth [MHz]
11b	2412	13291.3	10.115	> 0.5000
	2437	13296.7	10.102	> 0.5000
	2462	13306.7	10.113	> 0.5000
11g	2412	16677.9	16.374	> 0.5000
	2437	16714.2	16.376	> 0.5000
	2462	16705.7	16.379	> 0.5000
11n-20	2412	17759.0	17.632	> 0.5000
	2437	17747.6	17.606	> 0.5000
	2462	17752.1	17.594	> 0.5000
11n-40	2422	36433.1	35.869	> 0.5000
	2437	36445.7	35.902	> 0.5000
	2452	36542.1	35.897	> 0.5000
BT LE	2402	1036.0	0.726	> 0.5000
	2440	1035.2	0.721	> 0.5000
	2480	1035.9	0.724	> 0.5000

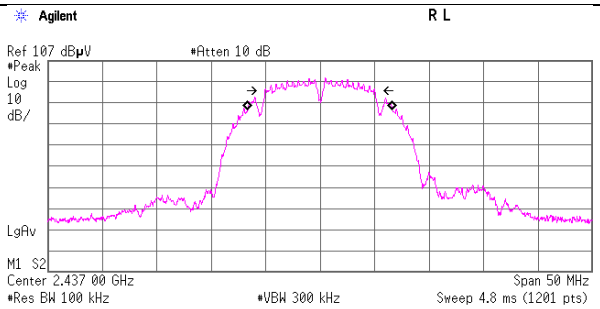
6dB Bandwidth

11b

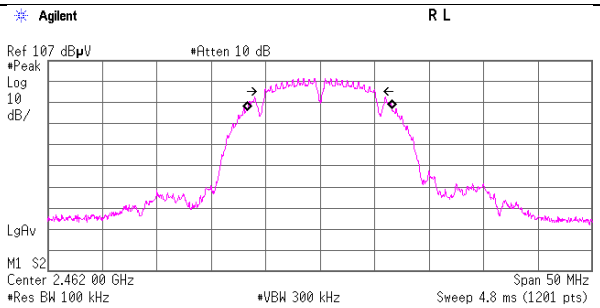
2412 MHz



2437 MHz

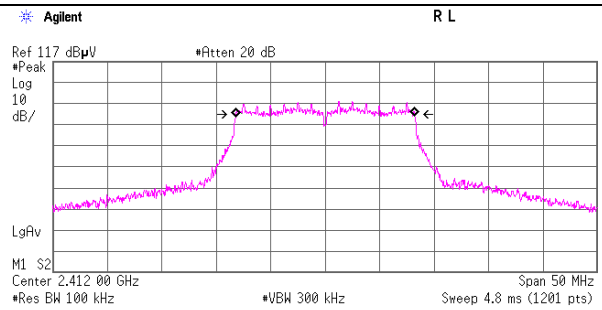


2462 MHz

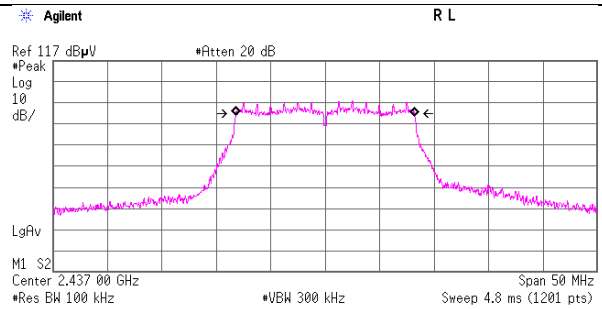


11g

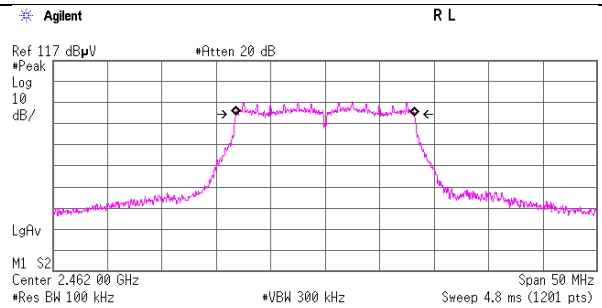
2412 MHz



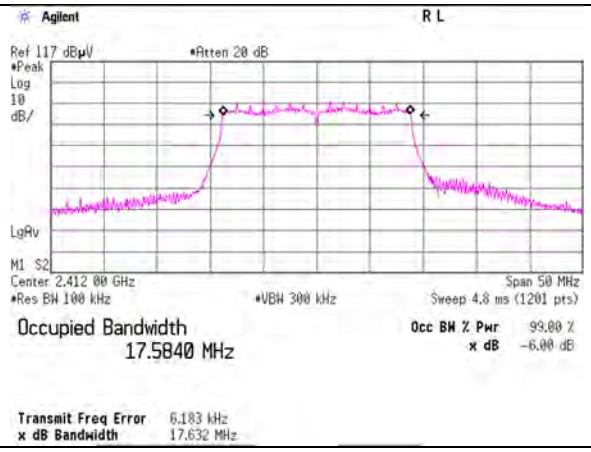
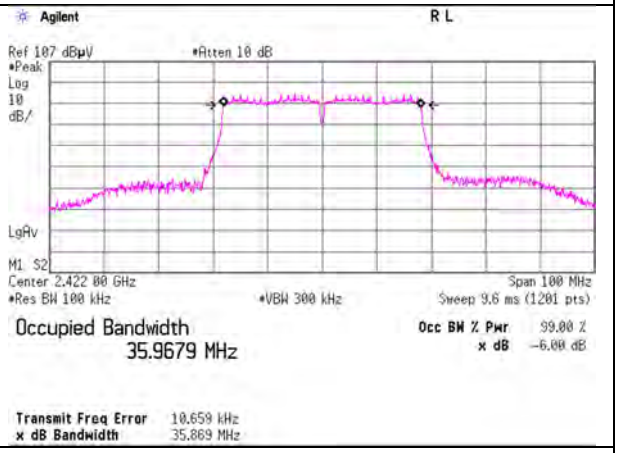
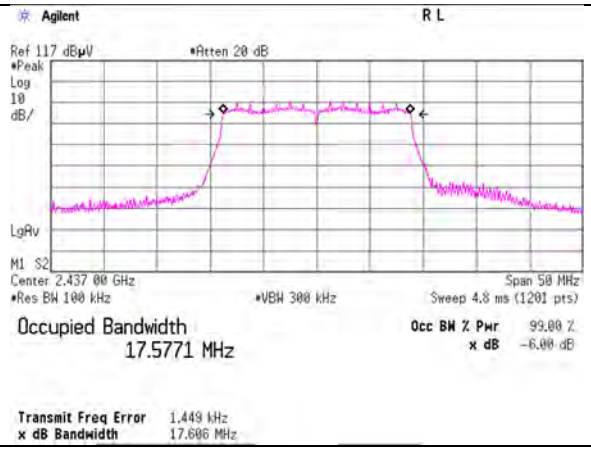
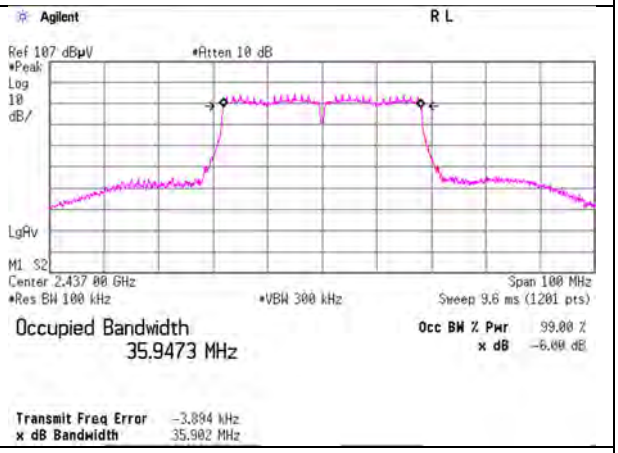
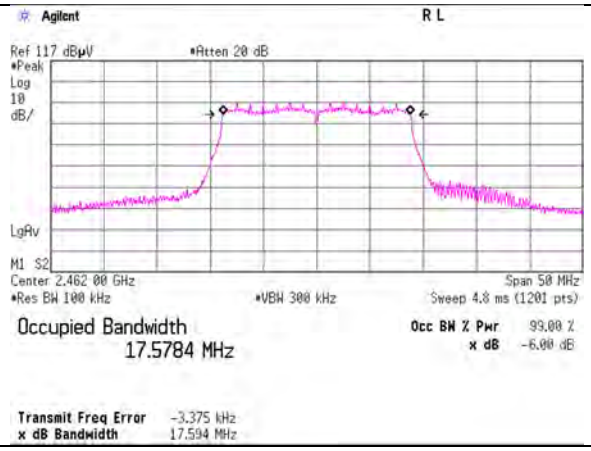
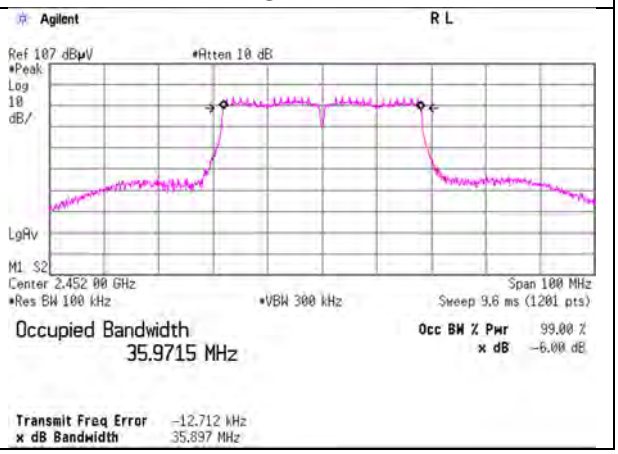
2437 MHz



2462 MHz



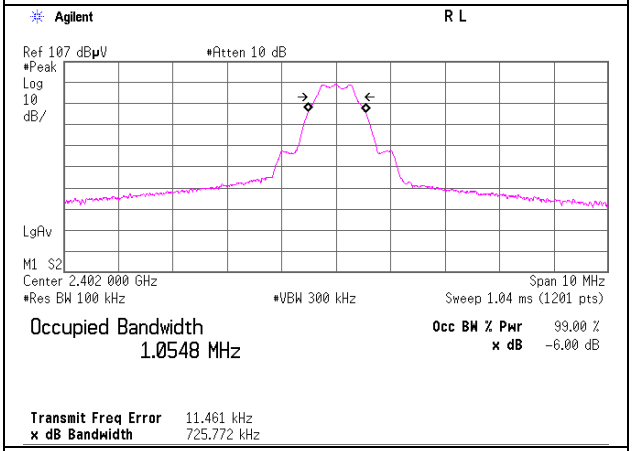
6dB Bandwidth

11n-20	11n-40
2412 MHz	**2422 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2452 MHz**
	

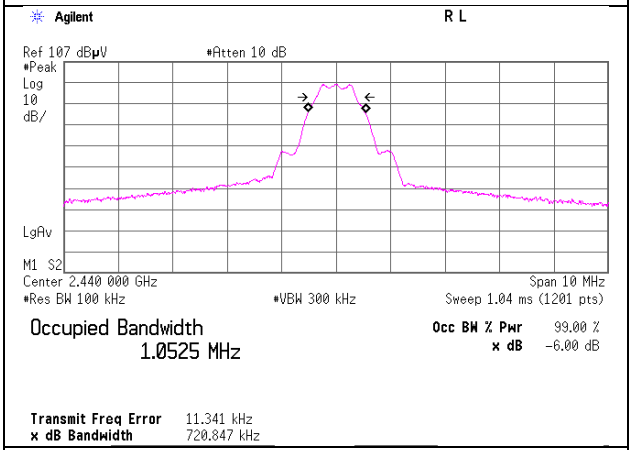
6dB Bandwidth

BT LE

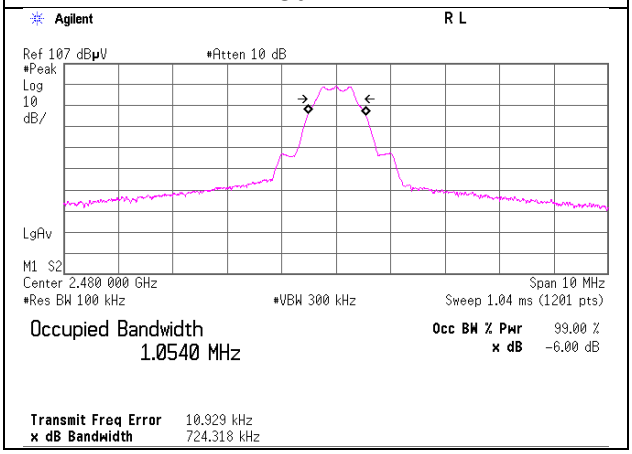
2402 MHz



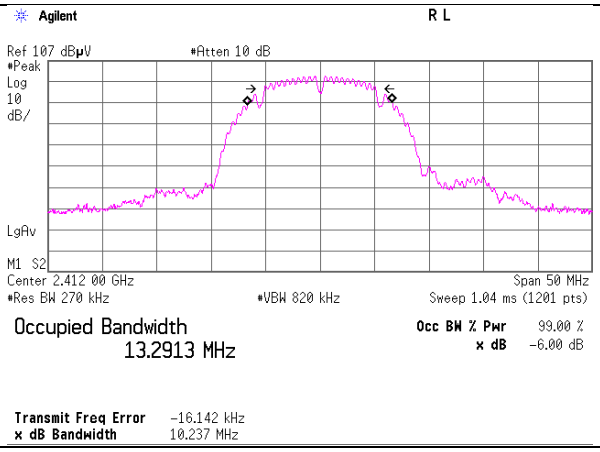
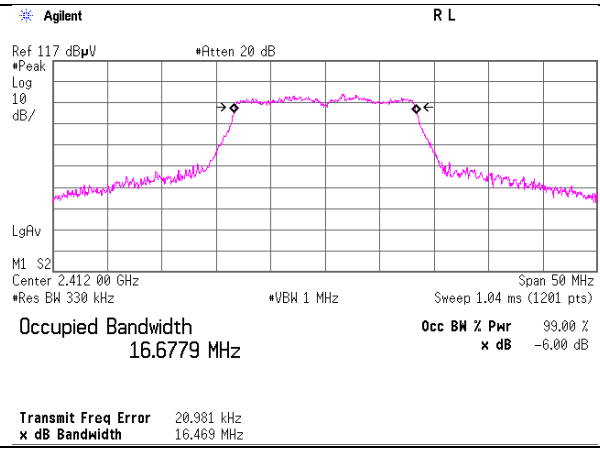
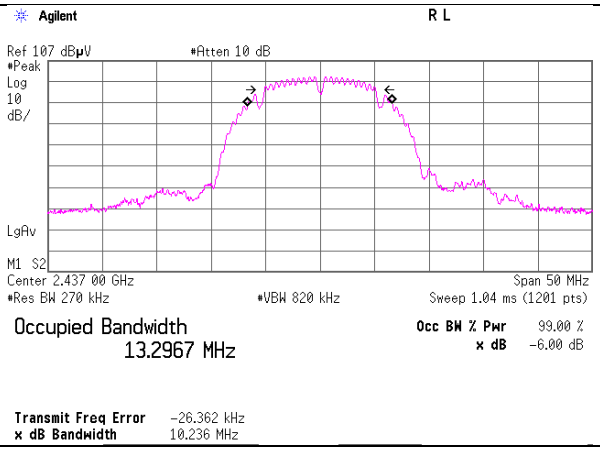
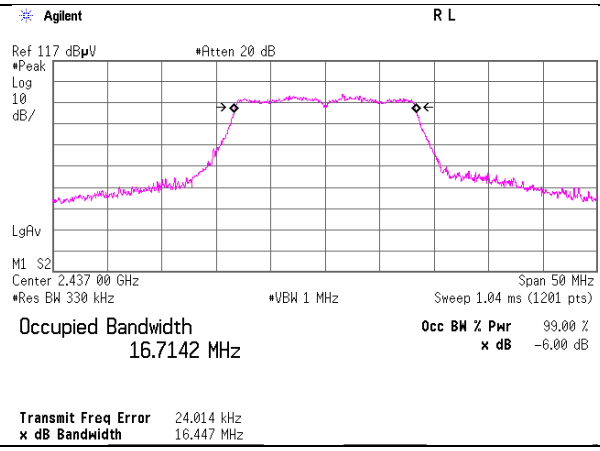
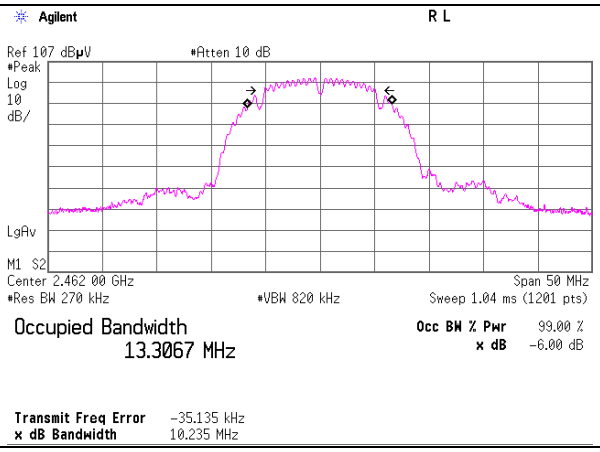
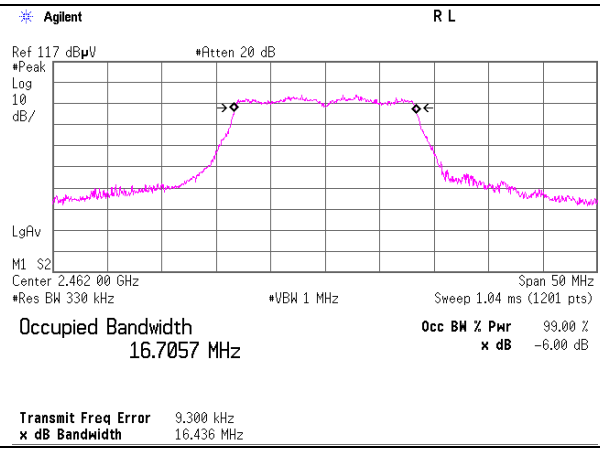
2440 MHz



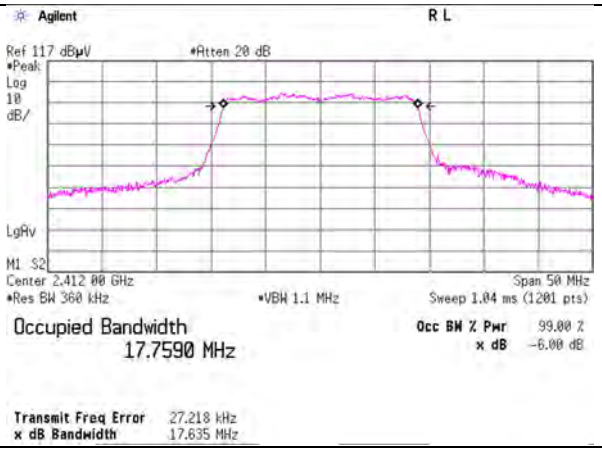
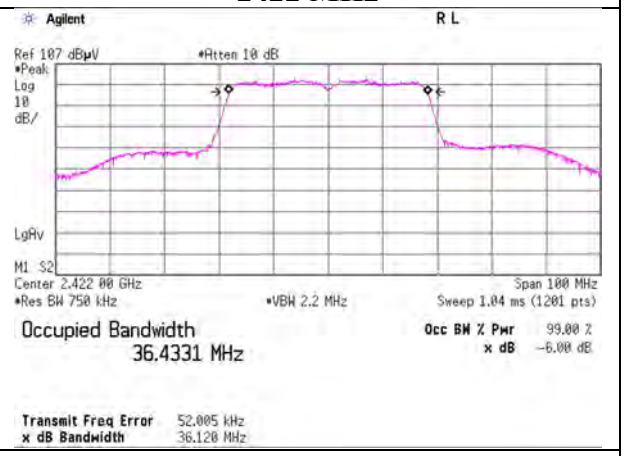
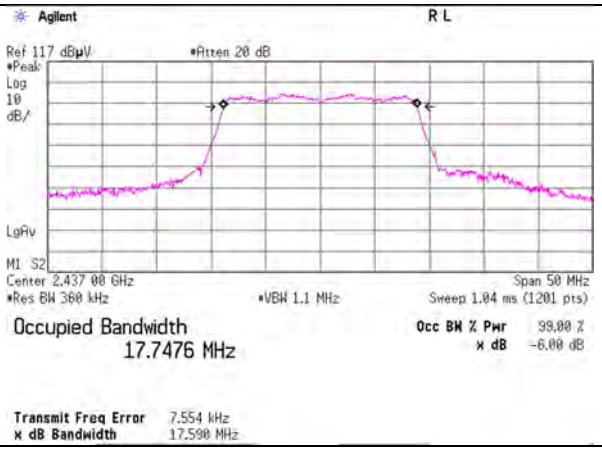
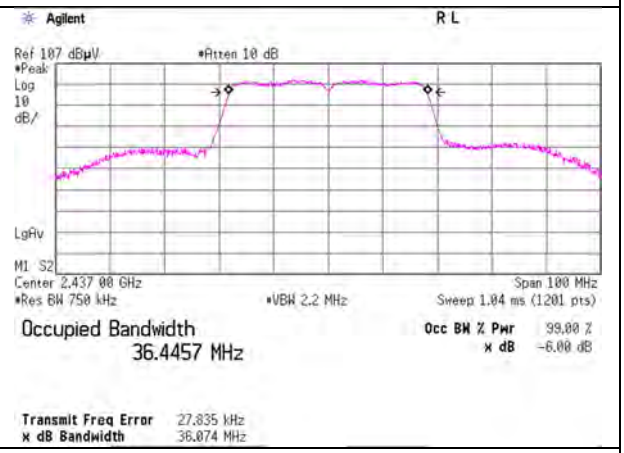
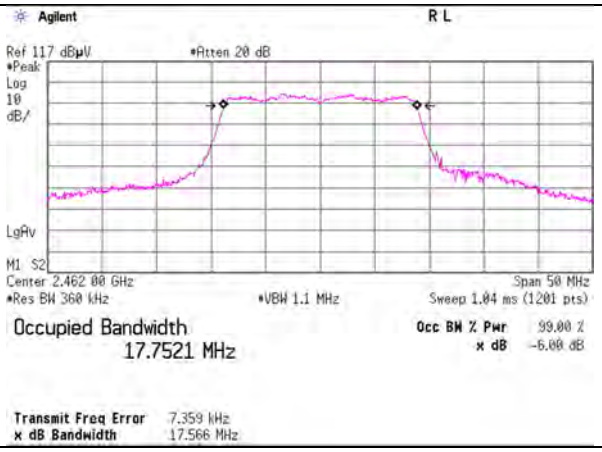
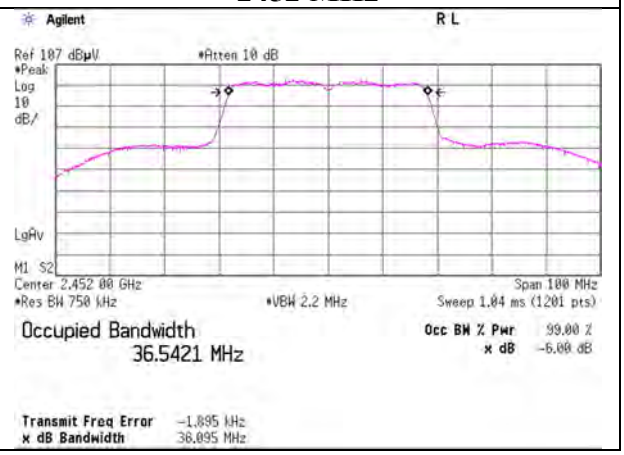
2480 MHz



99%Occupied Bandwidth

11b	11g
2412 MHz	**2412 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2462 MHz**
	

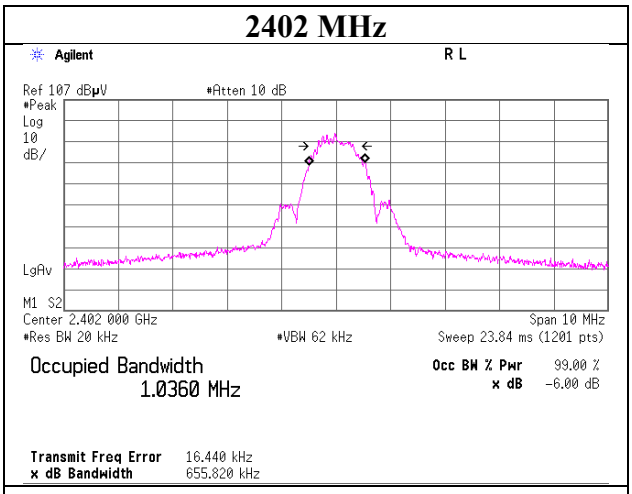
99% Occupied Bandwidth

11n-20	11n-40
2412 MHz	**2422 MHz**
	
2437 MHz	**2437 MHz**
	
2462 MHz	**2452 MHz**
	

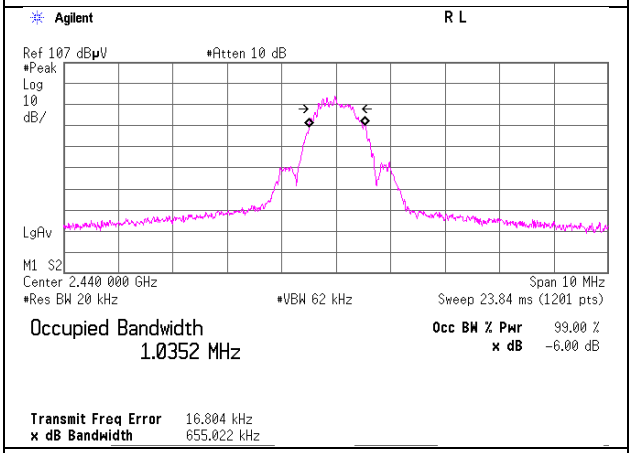
99% Occupied Bandwidth

BT LE

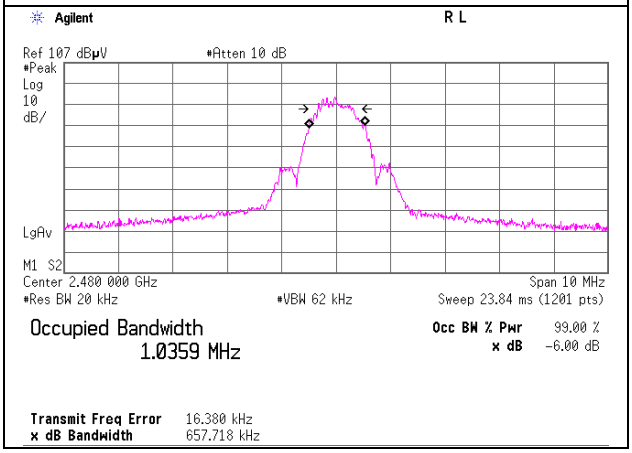
2402 MHz



2440 MHz



2480 MHz



Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12193629S-A-R2
Date	April 9, 2018
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx 11b

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	4.12	1.12	9.85	15.09	32.28	30.00	1000	14.91	2.50	17.59	57.41	36.02	4000	18.43
2437	4.49	1.12	9.85	15.46	35.16	30.00	1000	14.54	2.50	17.96	62.52	36.02	4000	18.06
2462	4.57	1.13	9.84	15.54	35.81	30.00	1000	14.46	2.50	18.04	63.68	36.02	4000	17.98

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain

2437MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
1	4.49	*
2	4.40	
5.5	3.93	
11	3.87	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12193629S-A-R2
Date	April 9, 2018
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx 11g

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	12.19	1.12	9.85	23.16	207.01	30.00	1000	6.84	2.50	25.66	368.13	36.02	4000	10.36
2437	12.15	1.12	9.85	23.12	205.12	30.00	1000	6.88	2.50	25.62	364.75	36.02	4000	10.40
2462	12.11	1.13	9.84	23.08	203.24	30.00	1000	6.92	2.50	25.58	361.41	36.02	4000	10.44

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz

Rate	Reading	Remark
[Mbps]	[dBm]	
6	12.15	*
9	12.05	
12	11.90	
18	11.77	
24	11.34	
36	11.33	
48	11.27	
54	11.44	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12193629S-A-R2
Date	April 9, 2018
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx 11n-20

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2412	12.52	1.12	9.85	23.49	223.36	30.00	1000	6.51	2.50	25.99	397.19	36.02	4000	10.03
2437	12.30	1.12	9.85	23.27	212.32	30.00	1000	6.73	2.50	25.77	377.57	36.02	4000	10.25
2462	12.72	1.13	9.84	23.69	233.88	30.00	1000	6.31	2.50	26.19	415.91	36.02	4000	9.83

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz

MCS Number [MCS]	Reading [dBm]	Remark
0	12.00	
1	12.30	*
2	12.08	
3	10.25	
4	10.07	
5	12.09	
6	11.96	
7	12.06	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12193629S-A-R2
Date	April 9, 2018
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx 11n-40

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2422	11.39	1.12	9.85	22.36	172.19	30.00	1000	7.64	2.50	24.86	306.20	36.02	4000	11.16
2437	11.08	1.12	9.85	22.05	160.32	30.00	1000	7.95	2.50	24.55	285.10	36.02	4000	11.47
2452	11.02	1.12	9.84	21.98	157.76	30.00	1000	8.02	2.50	24.48	280.54	36.02	4000	11.54

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

2437 MHz

MCS Number [MCS]	Reading [dBm]	Remark
0	11.08	*
1	9.92	
2	9.68	
3	9.87	
4	10.07	
5	10.73	
6	10.03	
7	10.04	

*: Worst Rate
All comparison were carried out on same frequency and measurement factors.

Maximum Peak Output Power

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	12193629S-A-R2
Date	March 16, 2018
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Yosuke Ishikawa
Mode	Tx BT LE

				Conducted Power					e.i.r.p. for RSS-247					
Freq.	Reading	Cable Loss	Atten. Loss	Result		Limit		Margin	Antenna Gain	Result		Limit		Margin
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dBm]	[mW]	[dB]	[dBi]	[dBm]	[mW]	[dBm]	[mW]	[dB]
2402	-10.38	1.12	9.85	0.59	1.15	30.00	1000	29.41	2.50	3.09	2.04	36.02	4000	32.93
2440	-10.36	1.12	9.84	0.60	1.15	30.00	1000	29.40	2.50	3.10	2.04	36.02	4000	32.92
2480	-10.44	1.13	9.84	0.53	1.13	30.00	1000	29.47	2.50	3.03	2.01	36.02	4000	32.99

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
e.i.r.p. Result = Conducted Power Result + Antenna Gain
*The equipment and cables were not used for factor 0 dB of the data sheets.

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12193629S-A-R2
Date	April 9, 2018
Temperature / Humidity	22 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx

11b **1 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	0.91	1.12	9.85	11.88	15.42	0.01	11.89	15.45
2437	1.37	1.12	9.85	12.34	17.14	0.01	12.35	17.18
2462	1.41	1.13	9.84	12.38	17.30	0.01	12.39	17.34

11g **6 Mbps**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	1.93	1.12	9.85	12.90	19.50	0.06	12.96	19.77
2437	1.81	1.12	9.85	12.78	18.97	0.06	12.84	19.23
2462	1.60	1.13	9.84	12.57	18.07	0.06	12.63	18.32

11n-20 **MCS 0**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2412	1.31	1.12	9.85	12.28	16.90	0.01	12.29	16.94
2437	1.35	1.12	9.85	12.32	17.06	0.01	12.33	17.10
2462	1.28	1.13	9.84	12.25	16.79	0.01	12.26	16.83

11n-40 **MCS 0**

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2422	-0.89	1.12	9.85	10.08	10.19	0.02	10.10	10.23
2437	-0.94	1.12	9.85	10.03	10.07	0.02	10.05	10.12
2452	-0.85	1.12	9.84	10.11	10.26	0.02	10.13	10.30

Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

*The equipment and cables were not used for factor 0 dB of the data sheets.

The average output power was measured with the lowest order modulation and lowest data rate configuration in each IEEE 802.11 mode based on KDB 248227 D01.

Average Output Power
(Reference data for RF Exposure)

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12193629S-A-R2
Date	March 16, 2018
Temperature / Humidity	24 deg. C / 40 % RH
Engineer	Yosuke Ishikawa
Mode	Tx BT LE

Freq.	Reading	Cable Loss	Atten. Loss	Result (Time average)		Duty factor	Result (Burst power average)	
[MHz]	[dBm]	[dB]	[dB]	[dBm]	[mW]	[dB]	[dBm]	[mW]
2402	-12.94	1.12	9.85	-1.97	0.64	2.03	0.06	1.01
2440	-12.95	1.12	9.84	-1.99	0.63	2.03	0.04	1.01
2480	-13.03	1.13	9.84	-2.06	0.62	2.03	-0.03	0.99

Sample Calculation:
Result (Time average) = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss
Result (Burst power average) = Time average + Duty factor

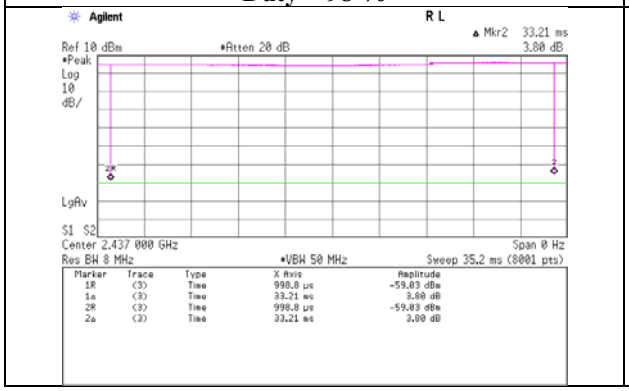
*The equipment and cables were not used for factor 0 dB of the data sheets.

Burst rate confirmation(for Radiated Spurious Emission)

Test place	Shonan EMC Lab. No.1 Measurement Room	
	No.1 Measurement Room	No.5 Shielded Room
Report No.	12193629S-A-R2	
Date	March 30, 2018	April 9, 2018
Temperature / Humidity	24 deg. C / 35 % RH	22 deg. C / 35 % RH
Engineer	Kazuya Noda	Kazuya Noda
Mode	Tx	

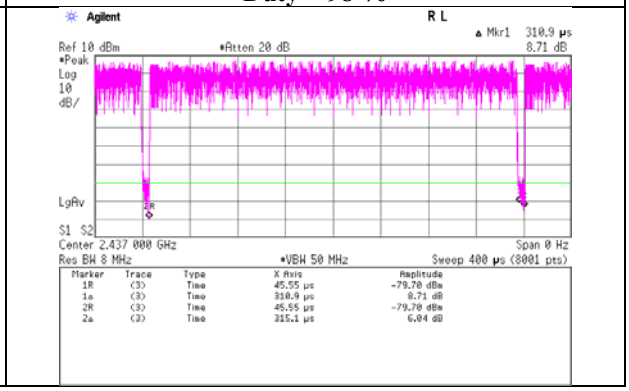
11b 1 Mbps

Duty > 98 %



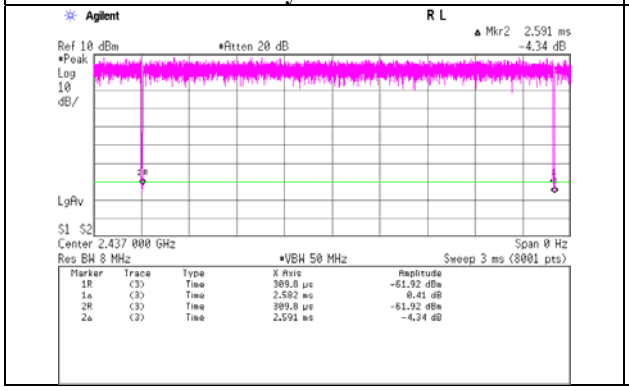
11g 6 Mbps

Duty > 98 %



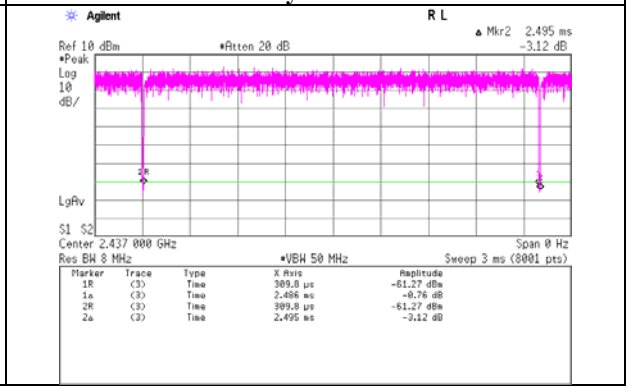
11n-20 MCS 1

Duty > 98 %



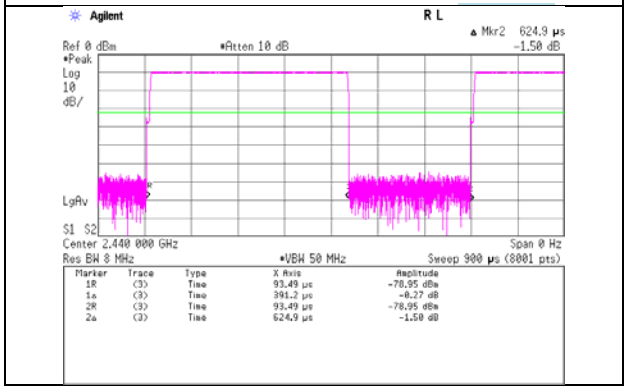
11n-40 MCS 0

Duty > 98 %



BT LE

Tx on / (Tx on + Tx off) =	**0.626**
Tx on / (Tx on + Tx off) * 100 =	**62.6 %**
Duty factor = 20 * log (0.6249 / 0.3912) =	**4.07 dB**



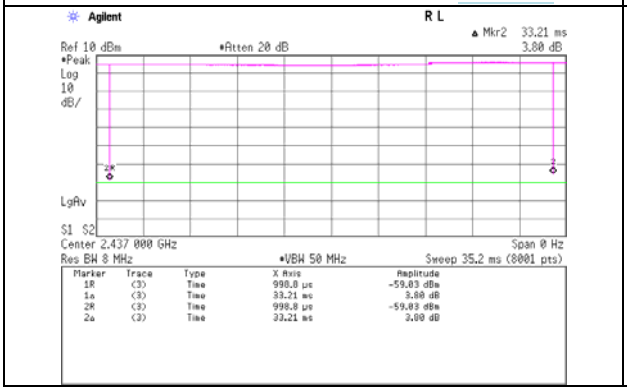
* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Burst rate confirmation(for Average Output Power)

Test place	Shonan EMC Lab.	
	No.1 Measurement Room	No.5 Shielded Room
Report No.	12193629S-A-R2	
Date	March 30, 2018	April 9, 2018
Temperature / Humidity	24 deg. C / 35 % RH	22 deg. C / 35 % RH
Engineer	Kazuya Noda	Kazuya Noda
Mode	Tx	

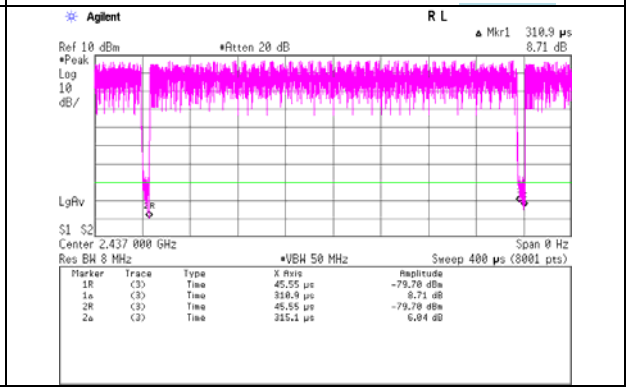
11b 1 Mbps

Tx on / (Tx on + Tx off) =	0.999
Tx on / (Tx on + Tx off) * 100 =	99.9 %
Duty factor = 10 * log (33.214 / 33.211) =	0.01 dB



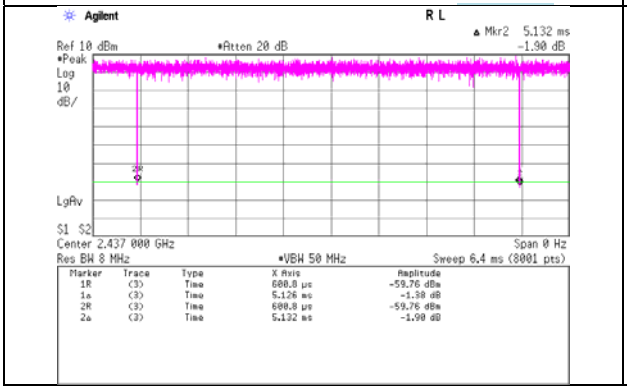
11g 6 Mbps

Tx on / (Tx on + Tx off) =	0.987
Tx on / (Tx on + Tx off) * 100 =	98.7 %
Duty factor = 10 * log (0.3151 / 0.3109) =	0.06 dB



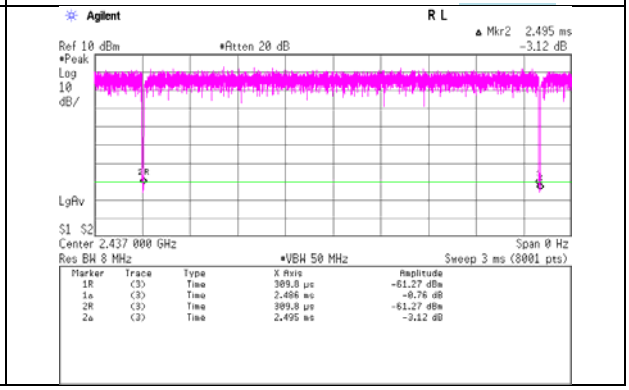
11n-20 MCS 0

Tx on / (Tx on + Tx off) =	0.999
Tx on / (Tx on + Tx off) * 100 =	99.9 %
Duty factor = 10 * log (5.132 / 5.126) =	0.01 dB



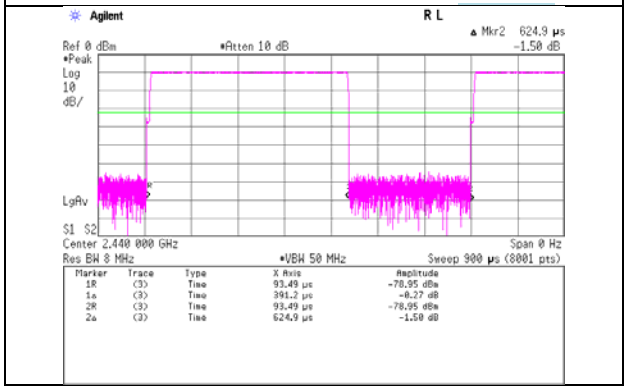
11n-40 MCS 0

Tx on / (Tx on + Tx off) =	0.996
Tx on / (Tx on + Tx off) * 100 =	99.6 %
Duty factor = 10 * log (2.495 / 2.486) =	0.02 dB



BT LE

Tx on / (Tx on + Tx off) =	0.626
Tx on / (Tx on + Tx off) * 100 =	62.6 %
Duty factor = 10 * log (0.6249 / 0.3912) =	2.03 dB



* Since the burst rate is not different between the channels, the data has been obtained on the representative channel.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	21 deg. C / 28 % RH	22 deg. C / 46 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11b 2412 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	50.80	27.26	14.15	44.13	2.33	50.41	73.90	23.4	247	285	
Hori.	4824.000	PK	56.21	31.46	6.77	44.46	2.33	52.31	73.90	21.5	191	271	
Hori.	7236.000	PK	46.95	36.62	8.43	44.00	2.33	50.33	73.90	23.5	100	0	
Hori.	9648.000	PK	48.27	38.66	9.30	43.83	2.33	54.73	73.90	19.1	100	0	
Hori.	2390.000	AV	40.27	27.26	14.15	44.13	2.33	39.88	53.90	14.0	247	285	
Hori.	4824.000	AV	52.61	31.46	6.77	44.46	2.33	48.71	53.90	**5.1**	191	271	
Hori.	7236.000	AV	36.75	36.62	8.43	44.00	2.33	40.13	53.90	13.7	100	0	
Hori.	9648.000	AV	37.99	38.66	9.30	43.83	2.33	44.45	53.90	9.4	100	0	
Vert.	2390.000	PK	49.08	27.26	14.15	44.13	2.33	48.69	73.90	25.2	134	303	
Vert.	4824.000	PK	56.07	31.46	6.77	44.46	2.33	52.17	73.90	21.7	172	42	
Vert.	7236.000	PK	47.21	36.62	8.43	44.00	2.33	50.59	73.90	23.3	100	0	
Vert.	9648.000	PK	47.81	38.66	9.30	43.83	2.33	54.27	73.90	19.6	100	0	
Vert.	2390.000	AV	39.05	27.26	14.15	44.13	2.33	38.66	53.90	15.2	134	303	
Vert.	4824.000	AV	52.69	31.46	6.77	44.46	2.33	48.79	53.90	**5.1**	172	42	
Vert.	7236.000	AV	37.24	36.62	8.43	44.00	2.33	40.62	53.90	13.2	100	0	
Vert.	9648.000	AV	37.53	38.66	9.30	43.83	2.33	43.99	53.90	9.9	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

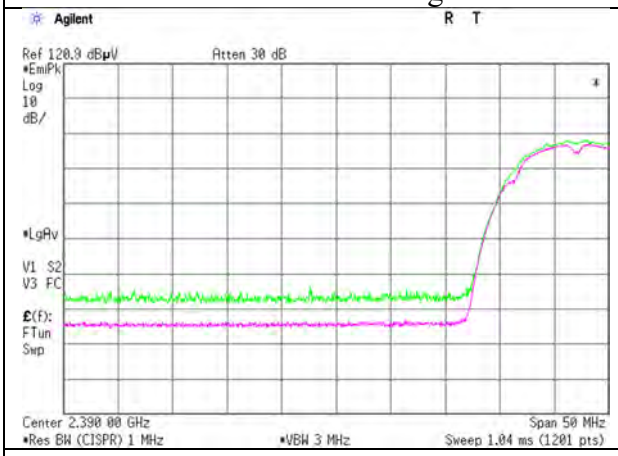
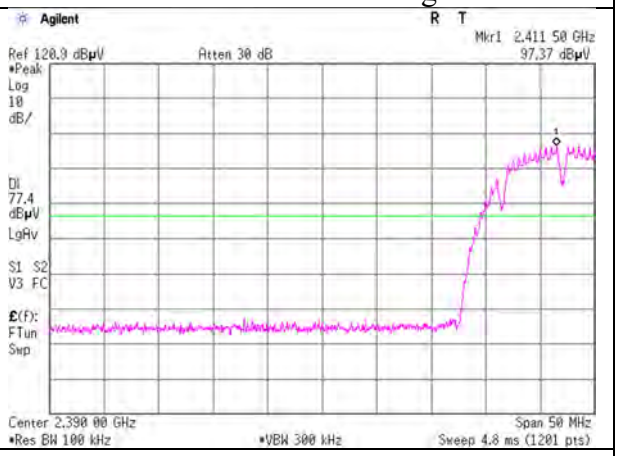
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

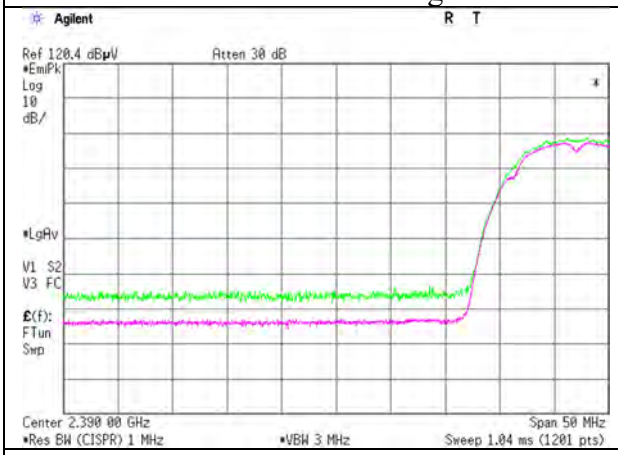
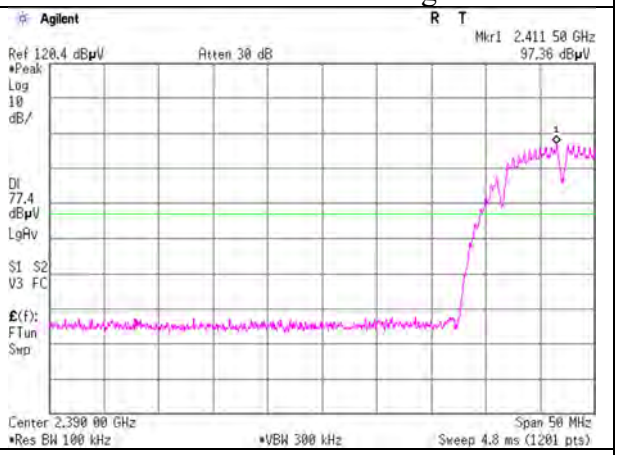
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	97.75	27.33	14.16	44.14	2.33	97.43	-	-	Carrier
Hori.	2400.000	PK	41.27	27.29	14.15	44.14	2.33	40.90	77.43	36.5	
Vert.	2412.000	PK	98.09	27.33	14.16	44.14	2.33	97.77	-	-	Carrier
Vert.	2400.000	PK	41.70	27.29	14.15	44.14	2.33	41.33	77.77	36.4	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 10, 2018
Temperature / Humidity	21 deg. C / 28 % RH
Engineer	Yosuke Ishikawa
	(1 GHz - 13 GHz)
Antenna	1001932PT
Mode	Tx 11b 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	21 deg. C / 28 % RH	22 deg. C / 46 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11b 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	57.38	31.59	6.80	44.47	2.33	53.63	73.90	20.2	145	261	
Hori.	7311.000	PK	47.62	36.75	8.50	44.03	2.33	51.17	73.90	22.7	100	0	
Hori.	9748.000	PK	47.94	38.78	9.38	43.84	2.33	54.59	73.90	19.3	100	0	
Hori.	4874.000	AV	53.80	31.59	6.80	44.47	2.33	50.05	53.90	**3.8**	145	261	
Hori.	7311.000	AV	39.38	36.75	8.50	44.03	2.33	42.93	53.90	10.9	100	0	
Hori.	9748.000	AV	39.77	38.78	9.38	43.84	2.33	46.42	53.90	7.4	100	0	
Vert.	4874.000	PK	56.64	31.59	6.80	44.47	2.33	52.89	73.90	21.0	117	296	
Vert.	7311.000	PK	47.04	36.75	8.50	44.03	2.33	50.59	73.90	23.3	100	0	
Vert.	9748.000	PK	47.55	38.78	9.38	43.84	2.33	54.20	73.90	19.7	100	0	
Vert.	4874.000	AV	53.10	31.59	6.80	44.47	2.33	49.35	53.90	4.5	117	296	
Vert.	7311.000	AV	39.25	36.75	8.50	44.03	2.33	42.80	53.90	11.1	100	0	
Vert.	9748.000	AV	40.07	38.78	9.38	43.84	2.33	46.72	53.90	7.1	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	21 deg. C / 28 % RH	22 deg. C / 46 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11b 2462 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.37	27.55	14.25	44.16	2.33	49.34	73.90	24.5	260	100	
Hori.	4924.000	PK	58.07	31.73	6.85	44.49	2.33	54.49	73.90	19.4	179	270	
Hori.	7386.000	PK	48.08	36.88	8.57	44.06	2.33	51.80	73.90	22.1	100	0	
Hori.	9848.000	PK	47.28	38.90	9.48	43.86	2.33	54.13	73.90	19.7	100	0	
Hori.	2483.500	AV	41.25	27.55	14.25	44.16	2.33	41.22	53.90	12.6	260	100	
Hori.	4924.000	AV	54.98	31.73	6.85	44.49	2.33	51.40	53.90	2.5	179	270	
Hori.	7386.000	AV	39.72	36.88	8.57	44.06	2.33	43.44	53.90	10.4	100	0	
Hori.	9848.000	AV	40.19	38.90	9.48	43.86	2.33	47.04	53.90	6.8	100	0	
Vert.	2483.500	PK	50.13	27.55	14.25	44.16	2.33	50.10	73.90	23.8	145	226	
Vert.	4924.000	PK	58.48	31.73	6.85	44.49	2.33	54.90	73.90	19.0	100	348	
Vert.	7386.000	PK	47.96	36.88	8.57	44.06	2.33	51.68	73.90	22.2	100	0	
Vert.	9848.000	PK	47.29	38.90	9.48	43.86	2.33	54.14	73.90	19.7	100	0	
Vert.	2483.500	AV	38.43	27.55	14.25	44.16	2.33	38.40	53.90	15.5	145	226	
Vert.	4924.000	AV	55.56	31.73	6.85	44.49	2.33	51.98	53.90	**1.9**	100	348	
Vert.	7386.000	AV	39.71	36.88	8.57	44.06	2.33	43.43	53.90	10.4	100	0	
Vert.	9848.000	AV	39.82	38.90	9.48	43.86	2.33	46.67	53.90	7.2	100	0	

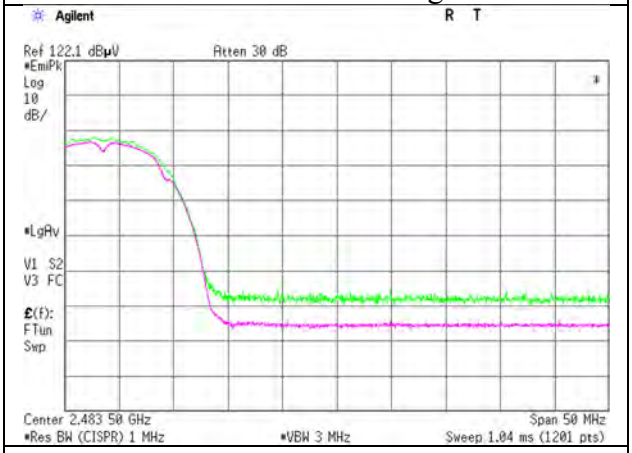
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 10, 2018
Temperature / Humidity	21 deg. C / 28 % RH
Engineer	Yosuke Ishikawa (1 GHz - 13 GHz)
Antenna	1001932PT
Mode	Tx 11b 2462 MHz

Horizontal

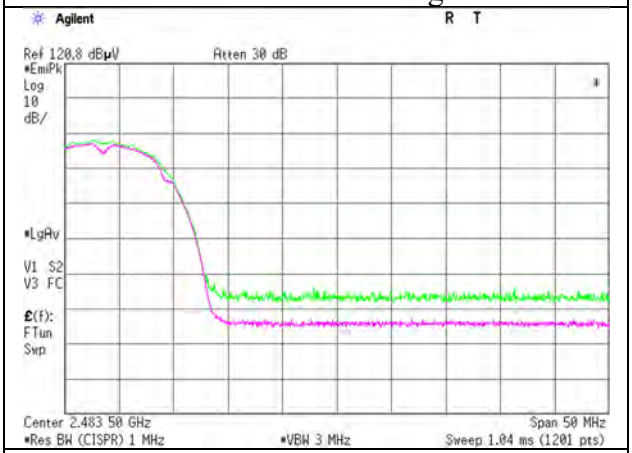
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	21 deg. C / 28 % RH	22 deg. C / 46 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11g 2412 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	62.94	27.26	14.15	44.13	2.33	62.55	73.90	11.3	241	268	
Hori.	4824.000	PK	55.81	31.46	6.77	44.46	2.33	51.91	73.90	21.9	141	269	
Hori.	7236.000	PK	47.01	36.62	8.43	44.00	2.33	50.39	73.90	23.5	100	0	
Hori.	9648.000	PK	48.44	38.66	9.30	43.83	2.33	54.90	73.90	19.0	100	0	
Hori.	2390.000	AV	50.91	27.26	14.15	44.13	2.33	50.52	53.90	**3.3**	241	268	
Hori.	4824.000	AV	46.37	31.46	6.77	44.46	2.33	42.47	53.90	11.4	141	269	
Hori.	7236.000	AV	39.09	36.62	8.43	44.00	2.33	42.47	53.90	11.4	100	0	
Hori.	9648.000	AV	39.92	38.66	9.30	43.83	2.33	46.38	53.90	7.5	100	0	
Vert.	2390.000	PK	53.14	27.26	14.15	44.13	2.33	52.75	73.90	21.1	168	249	
Vert.	4824.000	PK	54.61	31.46	6.77	44.46	2.33	50.71	73.90	23.1	102	342	
Vert.	7236.000	PK	47.18	36.62	8.43	44.00	2.33	50.56	73.90	23.3	100	0	
Vert.	9648.000	PK	47.44	38.66	9.30	43.83	2.33	53.90	73.90	20.0	100	0	
Vert.	2390.000	AV	43.14	27.26	14.15	44.13	2.33	42.75	53.90	11.1	168	249	
Vert.	4824.000	AV	45.87	31.46	6.77	44.46	2.33	41.97	53.90	11.9	102	342	
Vert.	7236.000	AV	38.97	36.62	8.43	44.00	2.33	42.35	53.90	11.5	100	0	
Vert.	9648.000	AV	39.90	38.66	9.30	43.83	2.33	46.36	53.90	7.5	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

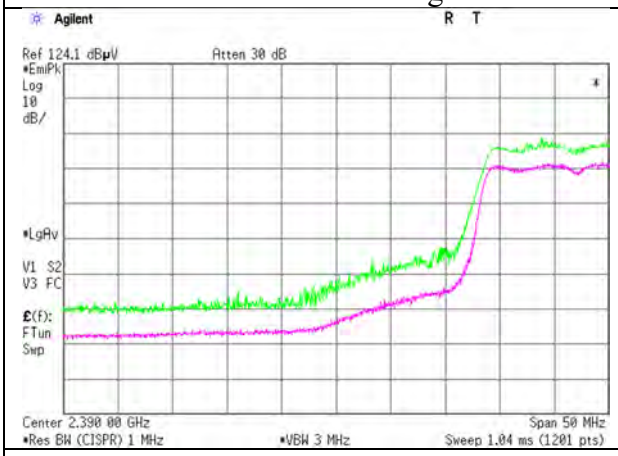
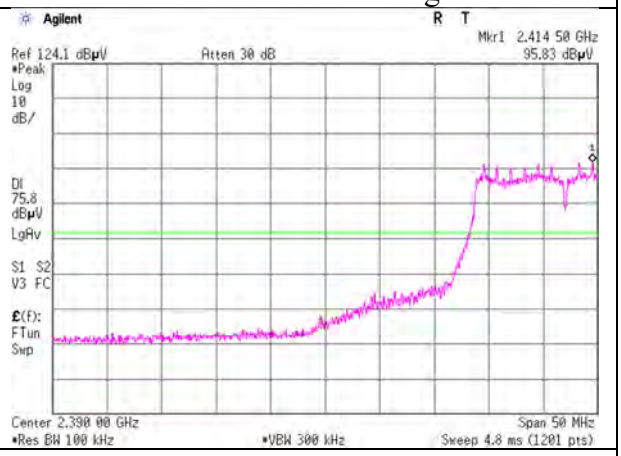
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

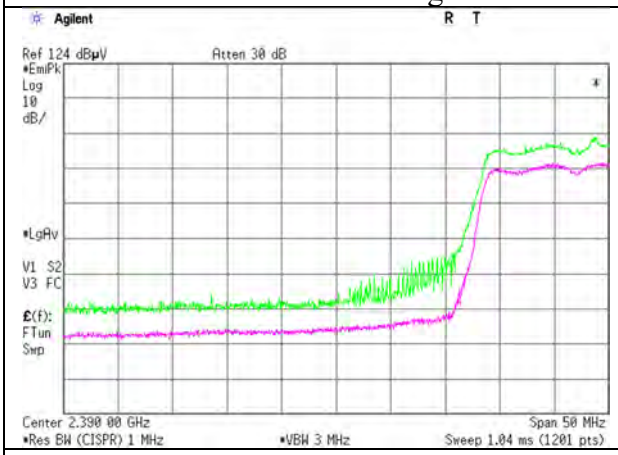
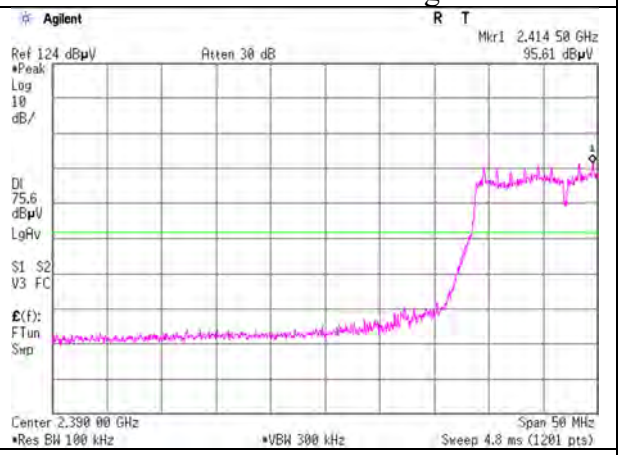
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	95.11	27.33	14.16	44.14	2.33	94.79	-	-	Carrier
Hori.	2400.000	PK	58.17	27.29	14.15	44.14	2.33	57.80	74.79	17.0	
Vert.	2412.000	PK	95.35	27.33	14.16	44.14	2.33	95.03	-	-	Carrier
Vert.	2400.000	PK	52.51	27.29	14.15	44.14	2.33	52.14	75.03	22.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 10, 2018
Temperature / Humidity	21 deg. C / 28 % RH
Engineer	Yosuke Ishikawa
	(1 GHz - 13 GHz)
Antenna	1001932PT
Mode	Tx 11g 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	21 deg. C / 28 % RH	22 deg. C / 46 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11g 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	56.63	31.59	6.80	44.47	2.33	52.88	73.90	21.0	186	270	
Hori.	7311.000	PK	47.02	36.75	8.50	44.03	2.33	50.57	73.90	23.3	100	0	
Hori.	9748.000	PK	48.20	38.78	9.38	43.84	2.33	54.85	73.90	19.0	100	0	
Hori.	4874.000	AV	48.09	31.59	6.80	44.47	2.33	44.34	53.90	9.5	186	270	
Hori.	7311.000	AV	39.16	36.75	8.50	44.03	2.33	42.71	53.90	11.1	100	0	
Hori.	9748.000	AV	39.69	38.78	9.38	43.84	2.33	46.34	53.90	7.5	100	0	
Vert.	4874.000	PK	57.21	31.59	6.80	44.47	2.33	53.46	73.90	20.4	121	274	
Vert.	7311.000	PK	47.07	36.75	8.50	44.03	2.33	50.62	73.90	23.2	100	0	
Vert.	9748.000	PK	47.40	38.78	9.38	43.84	2.33	54.05	73.90	19.8	100	0	
Vert.	4874.000	AV	47.64	31.59	6.80	44.47	2.33	43.89	53.90	10.0	121	274	
Vert.	7311.000	AV	39.27	36.75	8.50	44.03	2.33	42.82	53.90	11.0	100	0	
Vert.	9748.000	AV	39.96	38.78	9.38	43.84	2.33	46.61	53.90	**7.2**	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	21 deg. C / 28 % RH	22 deg. C / 46 % RH
Engineer	Yosuke Ishikawa	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11g 2462 MHz	

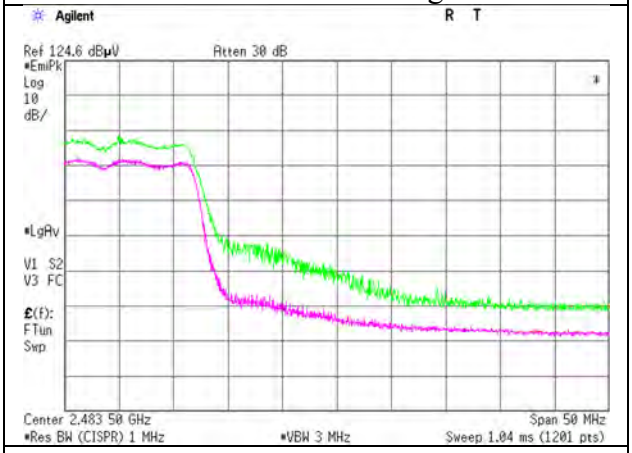
(* PK: Peak, AV: Average, QP: Quasi-Peak)

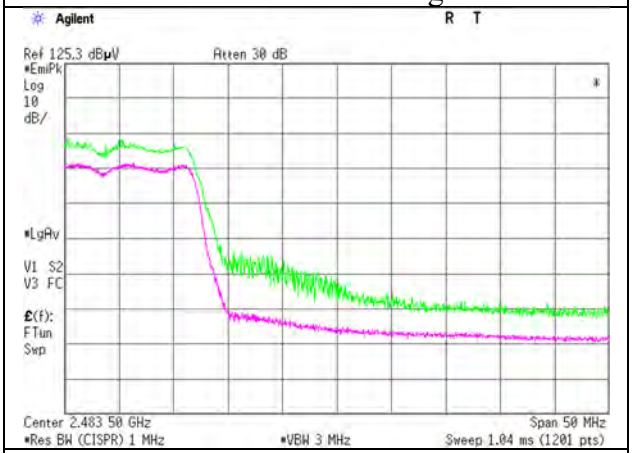
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	65.39	27.55	14.25	44.16	2.33	65.36	73.90	8.5	168	95	
Hori.	4924.000	PK	57.53	31.73	6.85	44.49	2.33	53.95	73.90	19.9	188	266	
Hori.	7386.000	PK	47.34	36.88	8.57	44.06	2.33	51.06	73.90	22.8	100	0	
Hori.	9848.000	PK	48.46	38.90	9.48	43.86	2.33	55.31	73.90	18.5	100	0	
Hori.	2483.500	AV	51.88	27.55	14.25	44.16	2.33	51.85	53.90	**2.0**	168	95	
Hori.	4924.000	AV	48.72	31.73	6.85	44.49	2.33	45.14	53.90	8.7	188	266	
Hori.	7386.000	AV	39.80	36.88	8.57	44.06	2.33	43.52	53.90	10.3	100	0	
Hori.	9848.000	AV	40.47	38.90	9.48	43.86	2.33	47.32	53.90	6.5	100	0	
Vert.	2483.500	PK	64.60	27.55	14.25	44.16	2.33	64.57	73.90	9.3	113	323	
Vert.	4924.000	PK	56.37	31.73	6.85	44.49	2.33	52.79	73.90	21.1	174	332	
Vert.	7386.000	PK	47.13	36.88	8.57	44.06	2.33	50.85	73.90	23.0	100	0	
Vert.	9848.000	PK	47.31	38.90	9.48	43.86	2.33	54.16	73.90	19.7	100	0	
Vert.	2483.500	AV	44.74	27.55	14.25	44.16	2.33	44.71	53.90	9.1	113	323	
Vert.	4924.000	AV	47.19	31.73	6.85	44.49	2.33	43.61	53.90	10.2	174	332	
Vert.	7386.000	AV	39.85	36.88	8.57	44.06	2.33	43.57	53.90	10.3	100	0	
Vert.	9848.000	AV	40.50	38.90	9.48	43.86	2.33	47.35	53.90	6.5	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 10, 2018
Temperature / Humidity	21 deg. C / 28 % RH
Engineer	Yosuke Ishikawa (1 GHz - 13 GHz)
Antenna	1001932PT
Mode	Tx 11g 2462 MHz

Horizontal
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	24 deg. C / 29 % RH	22 deg. C / 46 % RH
Engineer	Yasumasa Owaki	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11n-20 2412 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	59.91	27.26	14.15	44.13	2.33	59.52	73.90	14.3	161	270	
Hori.	4824.000	PK	53.56	31.46	6.77	44.46	2.33	49.66	73.90	24.2	141	286	
Hori.	7236.000	PK	47.09	36.62	8.43	44.00	2.33	50.47	73.90	23.4	150	1	
Hori.	9648.000	PK	48.67	38.66	9.30	43.83	2.33	55.13	73.90	18.7	150	1	
Hori.	2390.000	AV	47.53	27.26	14.15	44.13	2.33	47.14	53.90	6.7	161	270	
Hori.	4824.000	AV	44.88	31.46	6.77	44.46	2.33	40.98	53.90	12.9	141	286	
Hori.	7236.000	AV	37.87	36.62	8.43	44.00	2.33	41.25	53.90	12.6	150	1	
Hori.	9648.000	AV	39.16	38.66	9.30	43.83	2.33	45.62	53.90	8.2	150	1	
Vert.	2390.000	PK	71.96	27.26	14.15	44.13	2.33	71.57	73.90	**2.3**	143	222	
Vert.	4824.000	PK	53.76	31.46	6.77	44.46	2.33	49.86	73.90	24.0	175	40	
Vert.	7236.000	PK	47.20	36.62	8.43	44.00	2.33	50.58	73.90	23.3	150	1	
Vert.	9648.000	PK	48.45	38.66	9.30	43.83	2.33	54.91	73.90	18.9	150	1	
Vert.	2390.000	AV	51.57	27.26	14.15	44.13	2.33	51.18	53.90	2.7	143	222	
Vert.	4824.000	AV	44.20	31.46	6.77	44.46	2.33	40.30	53.90	13.6	175	40	
Vert.	7236.000	AV	38.05	36.62	8.43	44.00	2.33	41.43	53.90	12.4	150	1	
Vert.	9648.000	AV	38.97	38.66	9.30	43.83	2.33	45.43	53.90	8.4	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

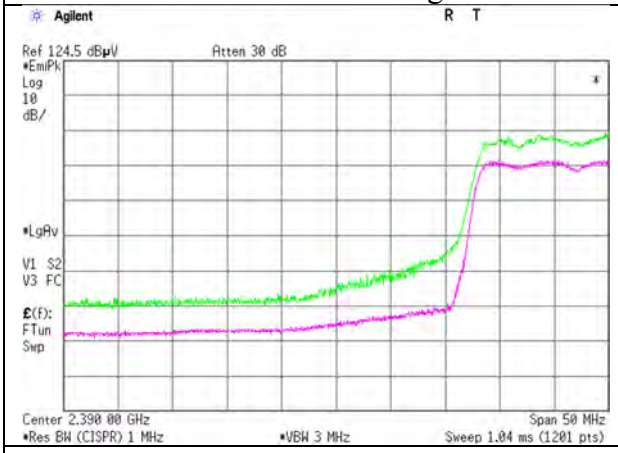
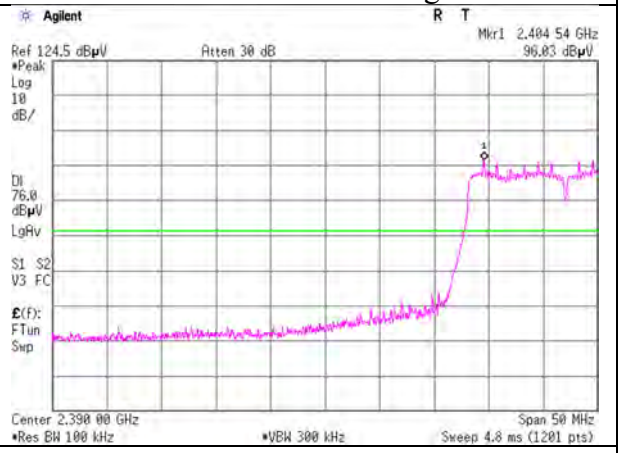
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

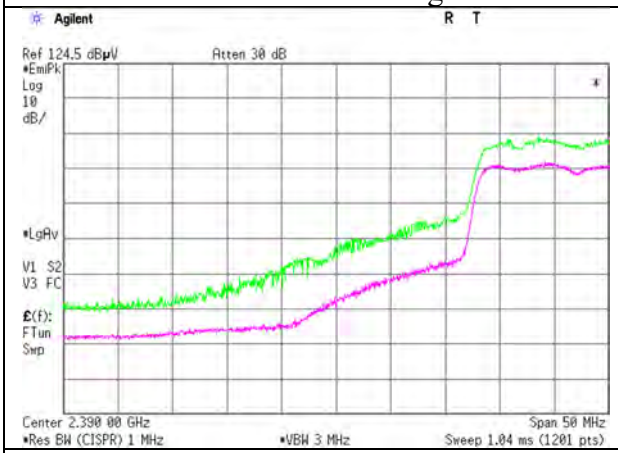
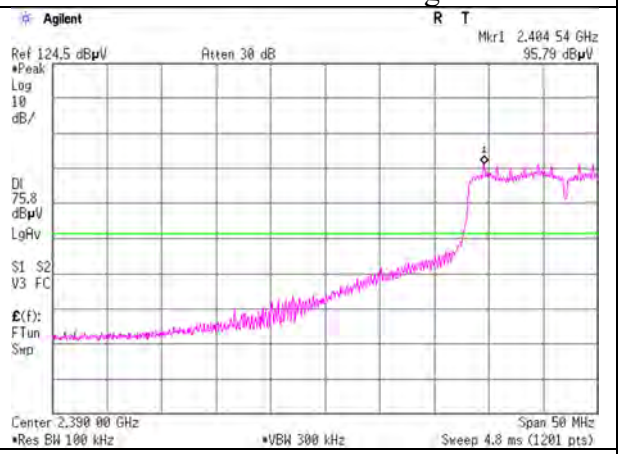
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	96.13	27.33	14.16	44.14	2.33	95.81	-	-	Carrier
Hori.	2400.000	PK	52.88	27.29	14.15	44.14	2.33	52.51	75.81	23.3	
Vert.	2412.000	PK	95.37	27.33	14.16	44.14	2.33	95.05	-	-	Carrier
Vert.	2400.000	PK	65.55	27.29	14.15	44.14	2.33	65.18	75.05	9.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 10, 2018
Temperature / Humidity	24 deg. C / 29 % RH
Engineer	Yasumasa Owaki
	(1 GHz - 13 GHz)
Antenna	1001932PT
Mode	Tx 11n-20 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	24 deg. C / 29 % RH	22 deg. C / 46 % RH
Engineer	Yasumasa Owaki	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11n-20 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	56.71	31.59	6.80	44.47	2.33	52.96	73.90	20.9	141	249	
Hori.	7311.000	PK	48.06	36.75	8.50	44.03	2.33	51.61	73.90	22.2	150	1	
Hori.	9748.000	PK	48.40	38.78	9.38	43.84	2.33	55.05	73.90	18.8	150	1	
Hori.	4874.000	AV	46.93	31.59	6.80	44.47	2.33	43.18	53.90	10.7	141	249	
Hori.	7311.000	AV	38.15	36.75	8.50	44.03	2.33	41.70	53.90	12.2	150	1	
Hori.	9748.000	AV	38.71	38.78	9.38	43.84	2.33	45.36	53.90	8.5	150	1	
Vert.	4874.000	PK	54.73	31.59	6.80	44.47	2.33	50.98	73.90	22.9	152	199	
Vert.	7311.000	PK	47.75	36.75	8.50	44.03	2.33	51.30	73.90	22.6	150	1	
Vert.	9748.000	PK	48.35	38.78	9.38	43.84	2.33	55.00	73.90	18.9	150	1	
Vert.	4874.000	AV	46.05	31.59	6.80	44.47	2.33	42.30	53.90	11.6	152	199	
Vert.	7311.000	AV	38.47	36.75	8.50	44.03	2.33	42.02	53.90	11.8	150	1	
Vert.	9748.000	AV	38.80	38.78	9.38	43.84	2.33	45.45	53.90	**8.4**	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	12193629S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	April 5, 2018	April 10, 2018	April 21, 2016
Temperature / Humidity	23 deg. C / 39 % RH	24 deg. C / 29 % RH	22 deg. C / 46 % RH
Engineer	Shiro Kobayashi	Yasumasa Owaki	Yosuke Ishikawa
	(30 MHz - 1 GHz)	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT		
Mode	Tx 11n-20 2462 MHz		

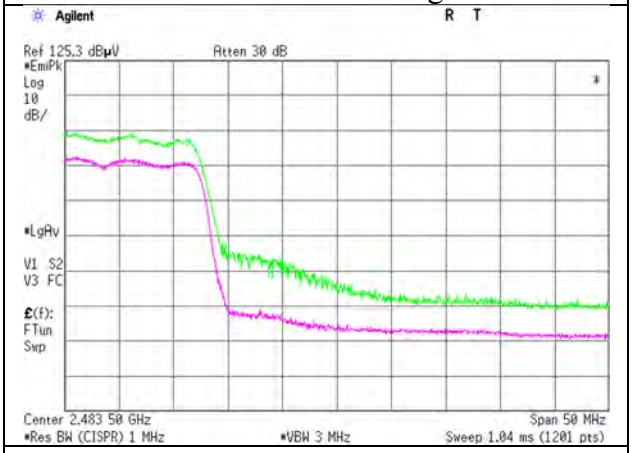
(* PK: Peak, AV: Average, QP: Quasi-Peak)

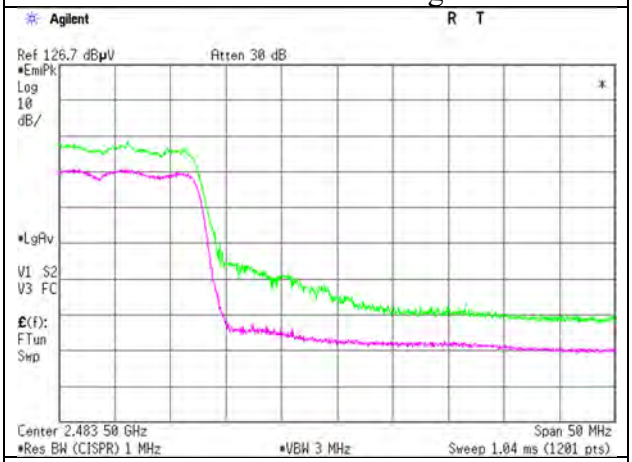
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	187.041	QP	22.01	16.12	7.97	32.09	0.00	14.01	43.50	29.4	100	1	
Hori.	258.674	QP	25.54	11.88	8.50	32.01	0.00	13.91	46.00	32.0	124	188	
Hori.	338.177	QP	23.51	14.11	8.92	31.96	0.00	14.58	46.00	31.4	133	173	
Hori.	613.312	QP	21.18	19.09	10.07	31.96	0.00	18.38	46.00	27.6	100	2	
Hori.	757.797	QP	21.31	20.12	10.57	31.78	0.00	20.22	46.00	25.7	100	1	
Hori.	2483.500	PK	60.77	27.55	14.25	44.16	2.33	60.74	73.90	13.1	148	267	
Hori.	4924.000	PK	56.08	31.73	6.85	44.49	2.33	52.50	73.90	21.4	106	235	
Hori.	7386.000	PK	48.30	36.88	8.57	44.06	2.33	52.02	73.90	21.8	150	1	
Hori.	9848.000	PK	48.59	38.90	9.48	43.86	2.33	55.44	73.90	18.4	150	1	
Hori.	2483.500	AV	46.25	27.55	14.25	44.16	2.33	46.22	53.90	7.6	148	267	
Hori.	4924.000	AV	46.80	31.73	6.85	44.49	2.33	43.22	53.90	10.6	106	235	
Hori.	7386.000	AV	38.80	36.88	8.57	44.06	2.33	42.52	53.90	11.3	150	1	
Hori.	9848.000	AV	39.62	38.90	9.48	43.86	2.33	46.47	53.90	7.4	150	1	
Vert.	158.628	QP	21.94	15.14	8.01	32.11	0.00	12.98	43.50	30.5	100	1	
Vert.	258.381	QP	32.19	11.87	8.50	32.01	0.00	20.55	46.00	25.4	101	83	
Vert.	338.186	QP	28.91	14.11	8.92	31.96	0.00	19.98	46.00	26.0	100	63	
Vert.	590.951	QP	21.32	18.89	9.99	31.96	0.00	18.24	46.00	27.7	100	3	
Vert.	861.632	QP	21.47	21.31	10.92	31.32	0.00	22.38	46.00	23.6	100	1	
Vert.	2483.500	PK	62.38	27.55	14.25	44.16	2.33	62.35	73.90	11.5	154	311	
Vert.	4924.000	PK	57.23	31.73	6.85	44.49	2.33	53.65	73.90	20.2	145	273	
Vert.	7386.000	PK	49.08	36.88	8.57	44.06	2.33	52.80	73.90	21.1	150	1	
Vert.	9848.000	PK	48.62	38.90	9.48	43.86	2.33	55.47	73.90	18.4	150	1	
Vert.	2483.500	AV	47.28	27.55	14.25	44.16	2.33	47.25	53.90	**6.6**	154	311	
Vert.	4924.000	AV	48.02	31.73	6.85	44.49	2.33	44.44	53.90	9.4	145	273	
Vert.	7386.000	AV	39.00	36.88	8.57	44.06	2.33	42.72	53.90	11.1	150	1	
Vert.	9848.000	AV	39.59	38.90	9.48	43.86	2.33	46.44	53.90	7.4	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 10, 2018
Temperature / Humidity	24 deg. C / 29 % RH
Engineer	Yasumasa Owaki
	(1 GHz - 13 GHz)
Antenna	1001932PT
Mode	Tx 11n-20 2462 MHz

Horizontal
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	24 deg. C / 29 % RH	22 deg. C / 46 % RH
Engineer	Yasumasa Owaki	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11n-40 2422 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	63.36	27.26	14.15	44.13	2.33	62.97	73.90	10.9	163	269	
Hori.	4844.000	PK	51.76	31.51	6.78	44.46	2.33	47.92	73.90	25.9	138	262	
Hori.	7266.000	PK	47.96	36.67	8.47	44.01	2.33	51.42	73.90	22.4	150	1	
Hori.	9688.000	PK	48.17	38.71	9.34	43.84	2.33	54.71	73.90	19.1	150	1	
Hori.	2390.000	AV	45.99	27.26	14.15	44.13	2.33	45.60	53.90	**8.3**	163	269	
Hori.	4844.000	AV	41.73	31.51	6.78	44.46	2.33	37.89	53.90	16.0	138	262	
Hori.	7266.000	AV	38.06	36.67	8.47	44.01	2.33	41.52	53.90	12.3	150	1	
Hori.	9688.000	AV	39.04	38.71	9.34	43.84	2.33	45.58	53.90	**8.3**	150	1	
Vert.	2390.000	PK	57.63	27.26	14.15	44.13	2.33	57.24	73.90	16.6	156	309	
Vert.	4844.000	PK	52.09	31.51	6.78	44.46	2.33	48.25	73.90	25.6	124	339	
Vert.	7266.000	PK	47.81	36.67	8.47	44.01	2.33	51.27	73.90	22.6	150	1	
Vert.	9688.000	PK	48.76	38.71	9.34	43.84	2.33	55.30	73.90	18.6	150	1	
Vert.	2390.000	AV	45.56	27.26	14.15	44.13	2.33	45.17	53.90	8.7	156	309	
Vert.	4844.000	AV	42.03	31.51	6.78	44.46	2.33	38.19	53.90	15.7	124	339	
Vert.	7266.000	AV	38.23	36.67	8.47	44.01	2.33	41.69	53.90	12.2	150	1	
Vert.	9688.000	AV	38.74	38.71	9.34	43.84	2.33	45.28	53.90	8.6	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

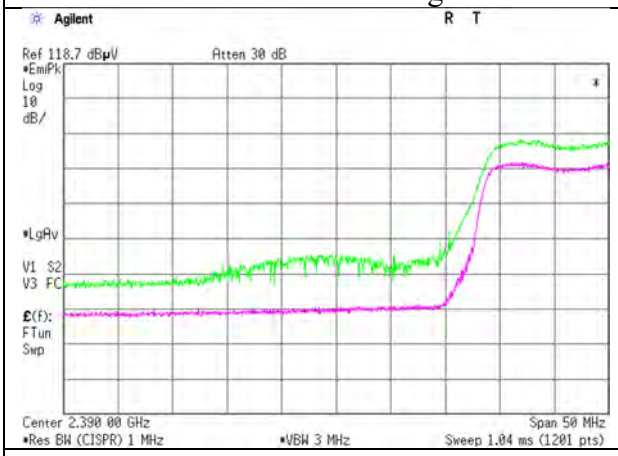
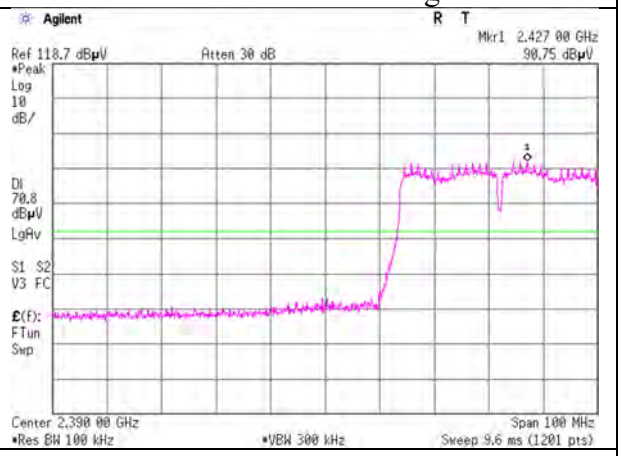
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

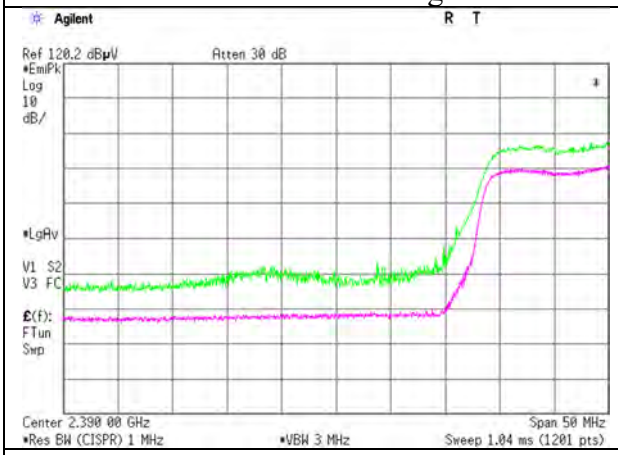
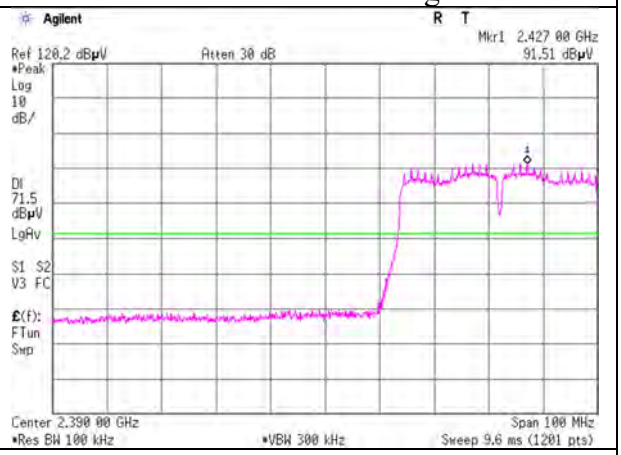
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2422.000	PK	90.38	27.36	14.18	44.14	2.33	90.11	-	-	Carrier
Hori.	2400.000	PK	51.65	27.29	14.15	44.14	2.33	51.28	70.11	18.8	
Vert.	2422.000	PK	91.07	27.36	14.18	44.14	2.33	90.80	-	-	Carrier
Vert.	2400.000	PK	52.28	27.29	14.15	44.14	2.33	51.91	70.80	18.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 10, 2018
Temperature / Humidity	24 deg. C / 29 % RH
Engineer	Yasumasa Owaki
	(1 GHz - 13 GHz)
Antenna	1001932PT
Mode	Tx 11n-40 2422 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	24 deg. C / 29 % RH	22 deg. C / 46 % RH
Engineer	Yasumasa Owaki	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11n-40 2437 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	4874.000	PK	53.16	31.59	6.80	44.47	2.33	49.41	73.90	24.4	136	248	
Hori.	7311.000	PK	48.10	36.75	8.50	44.03	2.33	51.65	73.90	22.2	150	1	
Hori.	9748.000	PK	47.94	38.78	9.38	43.84	2.33	54.59	73.90	19.3	150	1	
Hori.	4874.000	AV	42.50	31.59	6.80	44.47	2.33	38.75	53.90	15.1	136	248	
Hori.	7311.000	AV	38.02	36.75	8.50	44.03	2.33	41.57	53.90	12.3	150	1	
Hori.	9748.000	AV	38.75	38.78	9.38	43.84	2.33	45.40	53.90	8.5	150	1	
Vert.	4874.000	PK	52.56	31.59	6.80	44.47	2.33	48.81	73.90	25.0	143	197	
Vert.	7311.000	PK	47.80	36.75	8.50	44.03	2.33	51.35	73.90	22.5	150	1	
Vert.	9748.000	PK	48.33	38.78	9.38	43.84	2.33	54.98	73.90	18.9	150	1	
Vert.	4874.000	AV	42.72	31.59	6.80	44.47	2.33	38.97	53.90	14.9	143	197	
Vert.	7311.000	AV	38.41	36.75	8.50	44.03	2.33	41.96	53.90	11.9	150	1	
Vert.	9748.000	AV	38.97	38.78	9.38	43.84	2.33	45.62	53.90	**8.2**	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 10, 2018	April 21, 2016
Temperature / Humidity	24 deg. C / 29 % RH	22 deg. C / 46 % RH
Engineer	Yasumasa Owaki	Yosuke Ishikawa
	(1 GHz - 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT	
Mode	Tx 11n-40 2452 MHz	

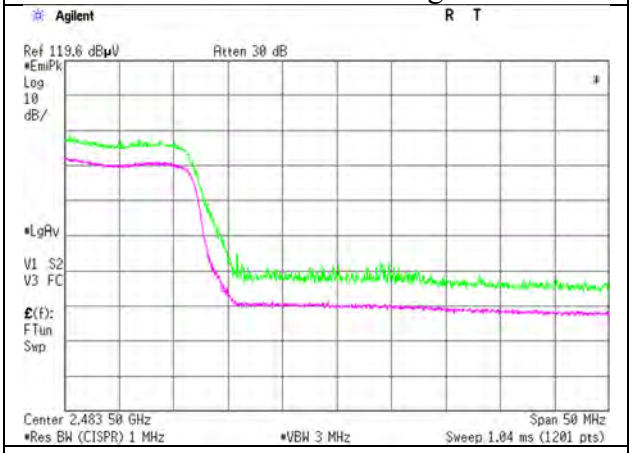
(* PK: Peak, AV: Average, QP: Quasi-Peak)

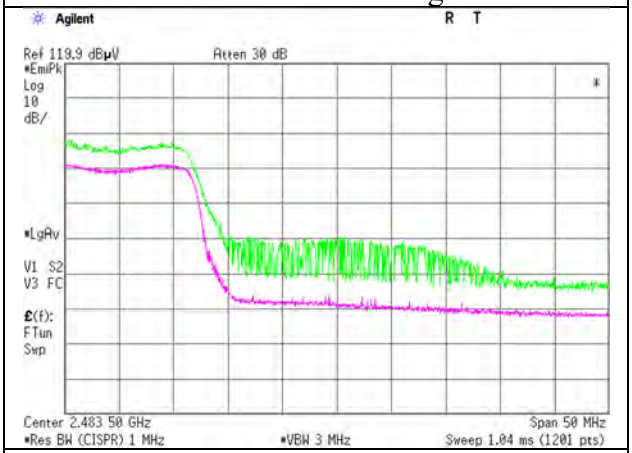
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	60.92	27.55	14.25	44.16	2.33	60.89	73.90	13.0	146	266	
Hori.	4904.000	PK	54.34	31.68	6.84	44.49	2.33	50.70	73.90	23.2	137	260	
Hori.	7356.000	PK	47.65	36.83	8.55	44.05	2.33	51.31	73.90	22.5	150	1	
Hori.	9808.000	PK	47.88	38.85	9.44	43.85	2.33	54.65	73.90	19.2	150	1	
Hori.	2483.500	AV	48.13	27.55	14.25	44.16	2.33	48.10	53.90	5.8	146	266	
Hori.	4904.000	AV	43.81	31.68	6.84	44.49	2.33	40.17	53.90	13.7	137	260	
Hori.	7356.000	AV	38.75	36.83	8.55	44.05	2.33	42.41	53.90	11.4	150	1	
Hori.	9808.000	AV	38.69	38.85	9.44	43.85	2.33	45.46	53.90	8.4	150	1	
Vert.	2483.500	PK	69.84	27.55	14.25	44.16	2.33	69.81	73.90	4.0	113	305	
Vert.	4904.000	PK	54.48	31.68	6.84	44.49	2.33	50.84	73.90	23.0	143	194	
Vert.	7356.000	PK	47.80	36.83	8.55	44.05	2.33	51.46	73.90	22.4	150	1	
Vert.	9808.000	PK	48.17	38.85	9.44	43.85	2.33	54.94	73.90	18.9	150	1	
Vert.	2483.500	AV	50.78	27.55	14.25	44.16	2.33	50.75	53.90	**3.1**	113	305	
Vert.	4904.000	AV	43.52	31.68	6.84	44.49	2.33	39.88	53.90	14.0	143	194	
Vert.	7356.000	AV	38.62	36.83	8.55	44.05	2.33	42.28	53.90	11.6	150	1	
Vert.	9808.000	AV	39.10	38.85	9.44	43.85	2.33	45.87	53.90	8.0	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 10, 2018
Temperature / Humidity	24 deg. C / 29 % RH
Engineer	Yasumasa Owaki
	(1 GHz - 13 GHz)
Antenna	1001932PT
Mode	Tx 11n-40 2452 MHz

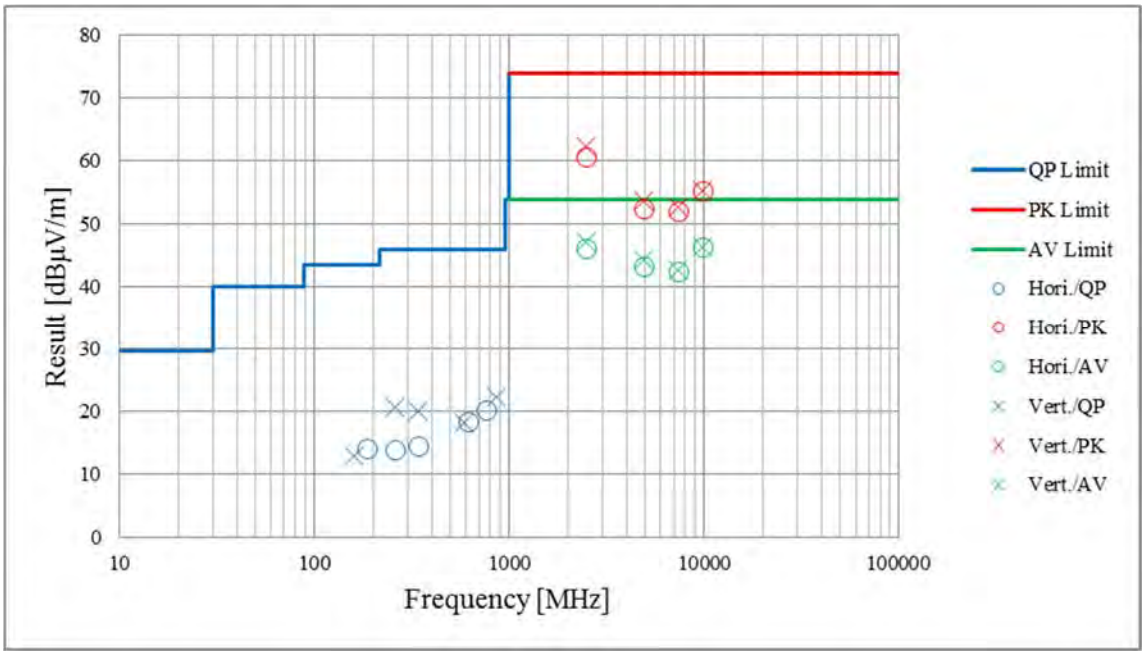
Horizontal
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12193629S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	April 5, 2018	April 10, 2018	April 21, 2016
Temperature / Humidity	23 deg. C / 39 % RH	24 deg. C / 29 % RH	22 deg. C / 46 % RH
Engineer	Shiro Kobayashi (30 MHz - 1 GHz)	Yasumasa Owaki (1 GHz - 13 GHz)	Yosuke Ishikawa (13 GHz – 26.5 GHz)
Antenna	1001932PT		
Mode	Tx 11n-20 2462 MHz		



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission

Report No.	12193629S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	2	3	3
Date	April 5, 2018	March 16, 2018	March 17, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 39 % RH	22 deg. C / 42 % RH	22 deg. C / 34 % RH	23 deg. C / 39 % RH
Engineer	Shiro Kobayashi	Shiro Kobayashi	Yosuke Ishikawa	Kazutaka Takeyama
	(30 MHz - 1 GHz)	(1 GHz – 2.8 GHz)	(2.8 GHz – 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932PT			
Mode	Tx BT LE 2402 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	359.997	QP	22.46	14.57	9.03	31.95	0.00	14.11	46.00	31.8	100	53	
Hori.	479.996	QP	22.28	17.05	9.56	31.96	0.00	16.93	46.00	29.0	193	196	
Hori.	2390.000	PK	44.15	27.16	14.56	36.58	2.33	51.62	73.90	**22.3**	156	275	
Hori.	4804.000	PK	50.30	31.40	6.74	44.45	2.33	46.32	73.90	27.5	146	342	
Hori.	7206.000	PK	48.26	36.56	8.41	43.99	2.33	51.57	73.90	22.3	100	0	
Vert.	37.400	QP	22.95	15.13	6.85	32.20	0.00	12.73	40.00	27.2	100	0	
Vert.	70.170	QP	26.28	6.21	7.19	32.18	0.00	7.50	40.00	32.5	100	341	
Vert.	168.000	QP	23.66	15.54	7.95	32.10	0.00	15.05	43.50	28.4	100	66	
Vert.	239.998	QP	25.00	11.57	8.38	32.03	0.00	12.92	46.00	33.0	242	341	
Vert.	253.456	QP	30.08	11.70	8.47	32.01	0.00	18.24	46.00	27.7	100	270	
Vert.	326.206	QP	23.68	13.87	8.86	31.98	0.00	14.43	46.00	31.5	100	177	
Vert.	479.996	QP	22.33	17.05	9.56	31.96	0.00	16.98	46.00	29.0	100	107	
Vert.	2390.000	PK	44.03	27.16	14.56	36.58	2.33	51.50	73.90	22.4	140	322	
Vert.	4804.000	PK	51.68	31.40	6.74	44.45	2.33	47.70	73.90	26.2	100	322	
Vert.	7206.000	PK	47.59	36.56	8.41	43.99	2.33	50.90	73.90	23.0	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	34.13	27.16	14.56	36.58	4.07	2.33	45.67	53.90	8.2	*1)
Hori.	4804.000	AV	42.05	31.40	6.74	44.45	4.07	2.33	42.14	53.90	11.8	
Hori.	7206.000	AV	39.86	36.56	8.41	43.99	4.07	2.33	47.24	53.90	6.7	
Vert.	2390.000	AV	34.40	27.16	14.56	36.58	4.07	2.33	45.94	53.90	8.0	*1)
Vert.	4804.000	AV	44.11	31.40	6.74	44.45	4.07	2.33	44.20	53.90	9.7	
Vert.	7206.000	AV	40.04	36.56	8.41	43.99	4.07	2.33	47.42	53.90	**6.5**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

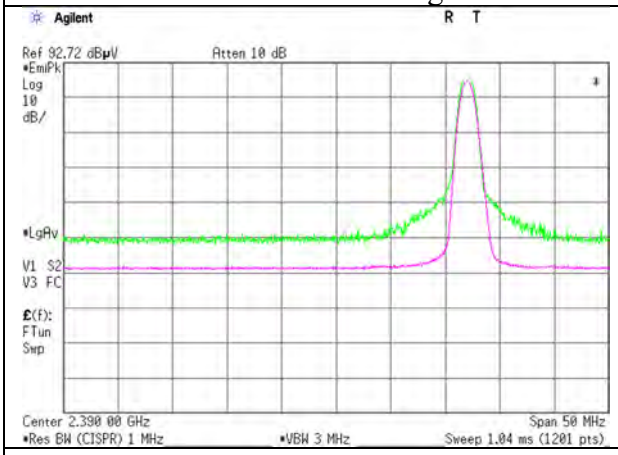
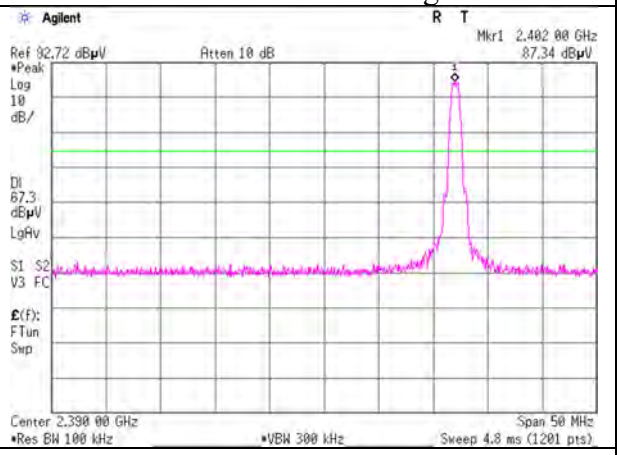
20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

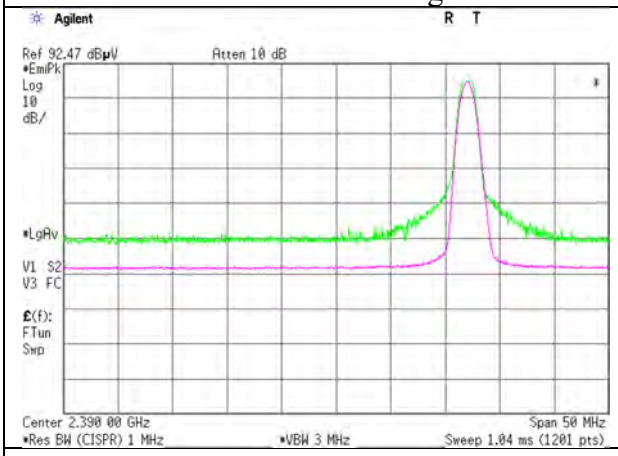
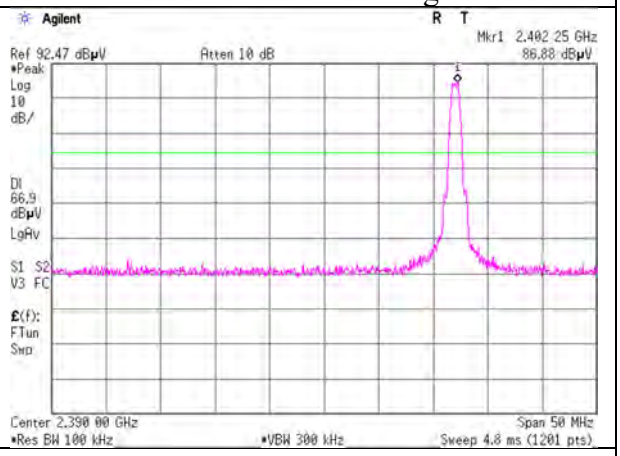
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	87.16	27.20	14.57	36.57	2.33	94.69	-	-	Carrier
Hori.	2400.000	PK	40.33	27.20	14.57	36.58	2.33	47.85	74.69	26.8	
Vert.	2402.000	PK	86.91	27.20	14.57	36.57	2.33	94.44	-	-	Carrier
Vert.	2400.000	PK	40.40	27.20	14.57	36.58	2.33	47.92	74.44	26.5	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	March 16, 2018
Temperature / Humidity	22 deg. C / 42 % RH
Engineer	Shiro Kobayashi (1 GHz – 2.8 GHz)
Antenna	1001932PT
Mode	Tx BT LE 2402 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	2	3	3
Date	April 5, 2018	March 16, 2018	March 17, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 39 % RH	22 deg. C / 42 % RH	22 deg. C / 34 % RH	23 deg. C / 39 % RH
Engineer	Shiro Kobayashi (30 MHz - 1 GHz)	Shiro Kobayashi (1 GHz – 2.8 GHz)	Yosuke Ishikawa (2.8 GHz – 13 GHz)	Kazutaka Takeyama (13 GHz – 26.5 GHz)
Antenna	1001932PT			
Mode	Tx BT LE 2440 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	359.997	QP	22.36	14.57	9.03	31.95	0.00	14.01	46.00	31.9	100	87	
Hori.	479.996	QP	22.32	17.05	9.56	31.96	0.00	16.97	46.00	29.0	207	188	
Hori.	4880.000	PK	49.94	31.61	6.82	44.48	2.33	46.22	73.90	27.6	115	357	
Hori.	7320.000	PK	47.30	36.76	8.52	44.03	2.33	50.88	73.90	23.0	100	0	
Vert.	37.400	QP	22.95	15.13	6.85	32.20	0.00	12.73	40.00	27.2	100	0	
Vert.	70.150	QP	26.57	6.21	7.19	32.18	0.00	7.79	40.00	32.2	100	327	
Vert.	168.000	QP	23.50	15.54	7.95	32.10	0.00	14.89	43.50	28.6	100	71	
Vert.	239.998	QP	25.92	11.57	8.38	32.03	0.00	13.84	46.00	32.1	237	353	
Vert.	253.195	QP	30.08	11.69	8.47	32.01	0.00	18.23	46.00	27.7	100	270	
Vert.	328.469	QP	24.72	13.91	8.87	31.98	0.00	15.52	46.00	30.4	100	262	
Vert.	479.996	QP	22.32	17.05	9.56	31.96	0.00	16.97	46.00	29.0	100	128	
Vert.	4880.000	PK	49.27	31.61	6.82	44.48	2.33	45.55	73.90	28.3	100	326	
Vert.	7320.000	PK	47.49	36.76	8.52	44.03	2.33	51.07	73.90	**22.8**	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	40.45	31.61	6.82	44.48	4.07	2.33	40.80	53.90	13.1	
Hori.	7320.000	AV	39.31	36.76	8.52	44.03	4.07	2.33	46.96	53.90	6.9	
Vert.	4880.000	AV	41.20	31.61	6.82	44.48	4.07	2.33	41.55	53.90	12.3	
Vert.	7320.000	AV	39.83	36.76	8.52	44.03	4.07	2.33	47.48	53.90	**6.4**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission

Report No.	12193629S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	2	3	3
Date	April 5, 2018	March 16, 2018	March 17, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 39 % RH	22 deg. C / 42 % RH	22 deg. C / 34 % RH	23 deg. C / 39 % RH
Engineer	Shiro Kobayashi (30 MHz - 1 GHz)	Shiro Kobayashi (1 GHz – 2.8 GHz)	Yosuke Ishikawa (2.8 GHz – 13 GHz)	Kazutaka Takeyama (13 GHz – 26.5 GHz)
Antenna	1001932PT			
Mode	Tx BT LE 2480 MHz			

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	359.997	QP	22.90	14.57	9.03	31.95	0.00	14.55	46.00	31.4	100	56	
Hori.	479.996	QP	22.38	17.05	9.56	31.96	0.00	17.03	46.00	28.9	198	205	
Hori.	2483.500	PK	53.41	27.48	14.66	36.52	2.33	61.36	73.90	**12.5**	244	267	
Hori.	4960.000	PK	51.01	31.83	6.89	44.51	2.33	47.55	73.90	26.3	100	354	
Hori.	7440.000	PK	48.14	36.97	8.63	44.08	2.33	51.99	73.90	21.9	100	0	
Vert.	37.400	QP	22.93	15.13	6.85	32.20	0.00	12.71	40.00	27.2	100	0	
Vert.	70.121	QP	26.10	6.21	7.19	32.18	0.00	7.32	40.00	32.6	100	289	
Vert.	168.000	QP	23.64	15.54	7.95	32.10	0.00	15.03	43.50	28.4	100	304	
Vert.	239.998	QP	25.38	11.57	8.38	32.03	0.00	13.30	46.00	32.7	238	349	
Vert.	253.012	QP	29.99	11.68	8.47	32.01	0.00	18.13	46.00	27.8	100	282	
Vert.	329.713	QP	24.55	13.94	8.87	31.97	0.00	15.39	46.00	30.6	100	177	
Vert.	479.996	QP	22.52	17.05	9.56	31.96	0.00	17.17	46.00	28.8	100	160	
Vert.	2483.500	PK	53.25	27.48	14.66	36.52	2.33	61.20	73.90	12.7	158	152	
Vert.	4960.000	PK	50.22	31.83	6.89	44.51	2.33	46.76	73.90	27.1	180	337	
Vert.	7440.000	PK	48.09	36.97	8.63	44.08	2.33	51.94	73.90	21.9	100	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

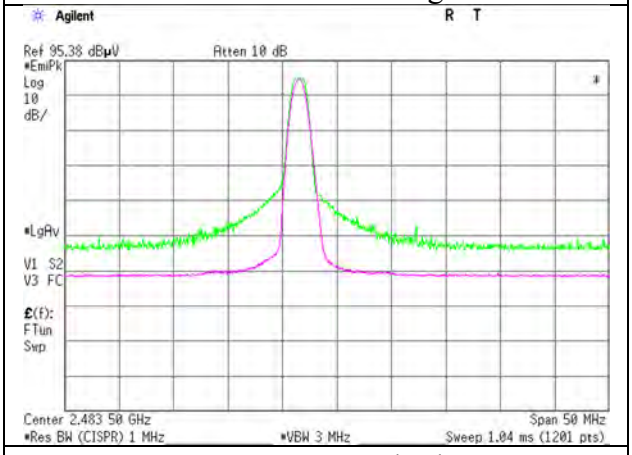
Average measurement value with duty factor

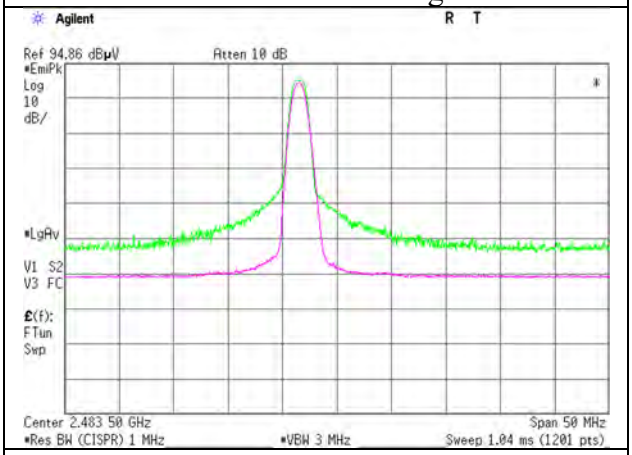
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	35.25	27.48	14.66	36.52	4.07	2.33	47.27	53.90	6.6	*1)
Hori.	4960.000	AV	42.71	31.83	6.89	44.51	4.07	2.33	43.32	53.90	10.6	
Hori.	7440.000	AV	39.84	36.97	8.63	44.08	4.07	2.33	47.76	53.90	6.1	
Vert.	2483.500	AV	35.13	27.48	14.66	36.52	4.07	2.33	47.15	53.90	6.8	*1)
Vert.	4960.000	AV	42.40	31.83	6.89	44.51	4.07	2.33	43.01	53.90	10.9	
Vert.	7440.000	AV	40.06	36.97	8.63	44.08	4.07	2.33	47.98	53.90	**5.9**	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	2
Date	March 16, 2018
Temperature / Humidity	22 deg. C / 42 % RH
Engineer	Shiro Kobayashi (1 GHz – 2.8 GHz)
Antenna	1001932PT
Mode	Tx BT LE 2480 MHz

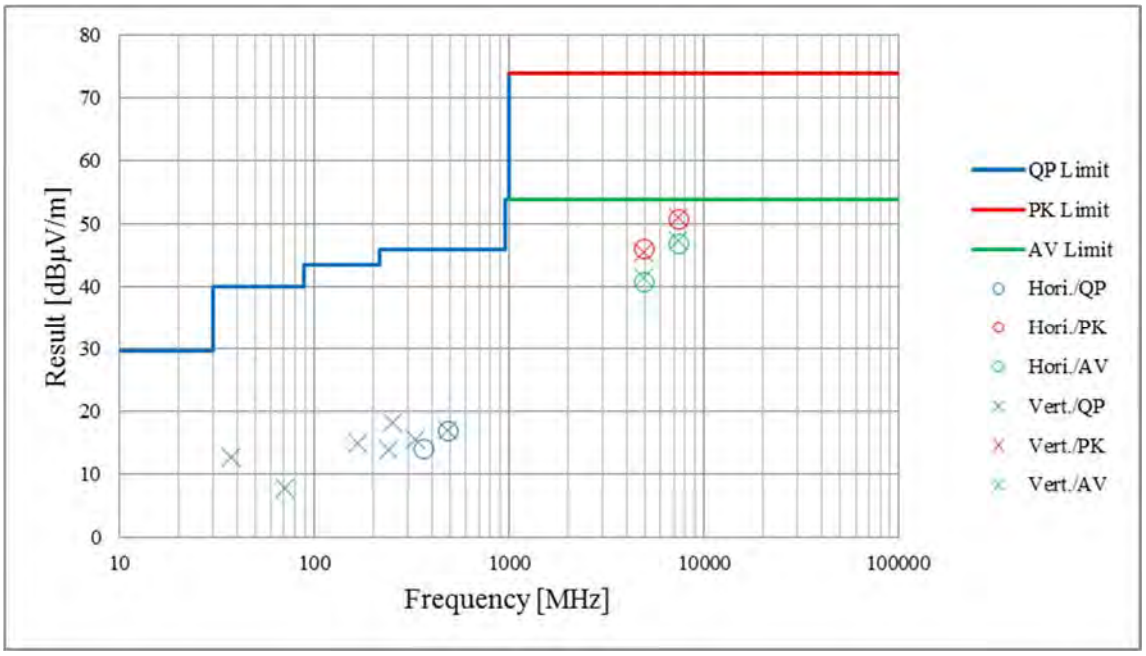
Horizontal
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12193629S-A-R2			
Test place	Shonan EMC Lab.			
Semi Anechoic Chamber	3	2	3	3
Date	April 5, 2018	March 16, 2018	March 17, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 39 % RH	22 deg. C / 42 % RH	22 deg. C / 34 % RH	23 deg. C / 39 % RH
Engineer	Shiro Kobayashi (30 MHz - 1 GHz)	Shiro Kobayashi (1 GHz – 2.8 GHz)	Yosuke Ishikawa (2.8 GHz – 13 GHz)	Kazutaka Takeyama (13 GHz – 26.5 GHz)
Antenna	1001932PT			
Mode	Tx BT LE 2440 MHz			



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11b 2412 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	43.79	27.26	14.15	36.58	2.33	50.95	73.90	22.9	159	261	
Hori.	2390.000	AV	34.59	27.26	14.15	36.58	2.33	41.75	53.90	**12.1**	159	261	
Vert.	2390.000	PK	43.72	27.26	14.15	36.58	2.33	50.88	73.90	23.0	149	233	
Vert.	2390.000	AV	34.61	27.26	14.15	36.58	2.33	41.77	53.90	**12.1**	149	233	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

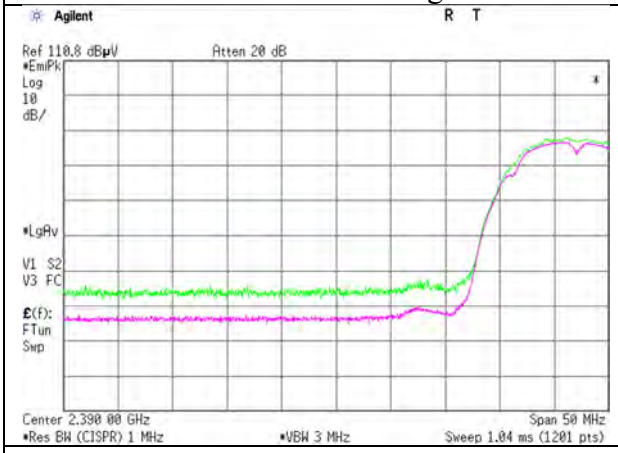
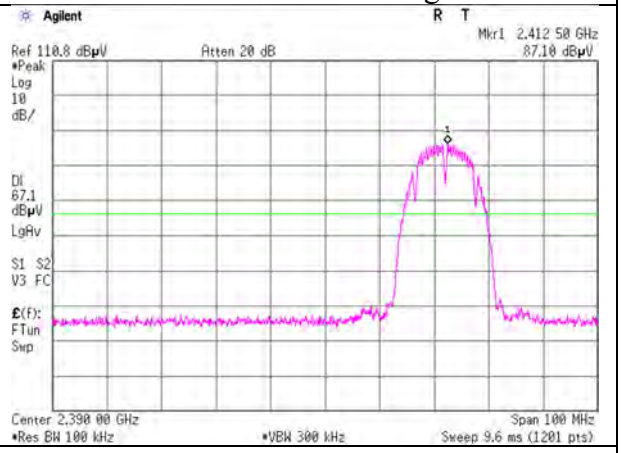
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	87.32	27.33	14.16	36.57	2.33	94.57	-	-	Carrier
Hori.	2400.000	PK	36.50	27.29	14.15	36.58	2.33	43.69	74.57	30.9	
Vert.	2412.000	PK	89.09	27.33	14.16	36.57	2.33	96.34	-	-	Carrier
Vert.	2400.000	PK	37.04	27.29	14.15	36.58	2.33	44.23	76.34	32.1	

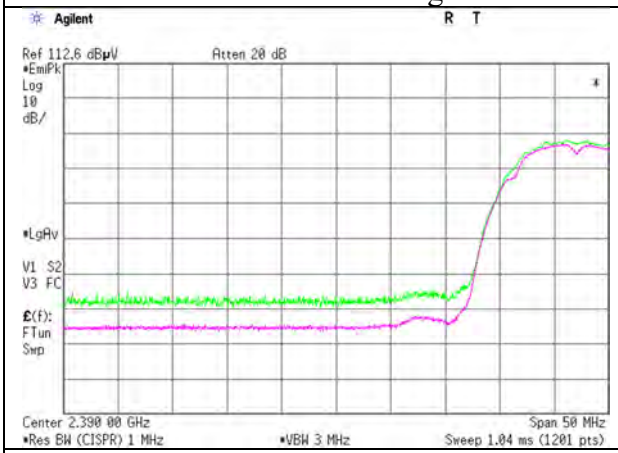
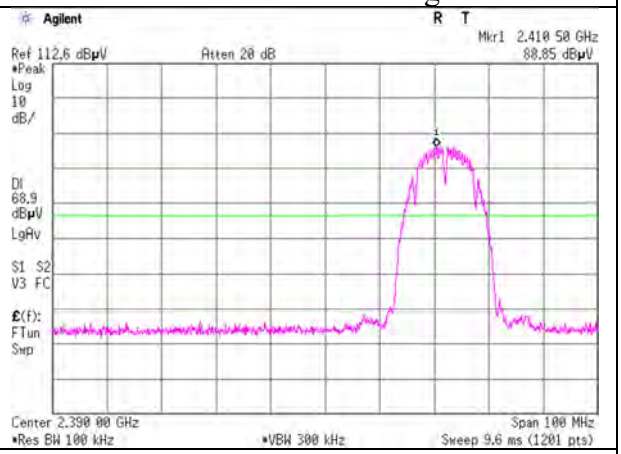
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki (1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11b 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11b 2462 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	44.57	27.55	14.25	36.52	2.33	52.18	73.90	21.7	160	295	
Hori.	2483.500	AV	34.81	27.55	14.25	36.52	2.33	42.42	53.90	**11.4**	160	295	
Vert.	2483.500	PK	44.63	27.55	14.25	36.52	2.33	52.24	73.90	21.6	157	232	
Vert.	2483.500	AV	34.57	27.55	14.25	36.52	2.33	42.18	53.90	11.7	157	232	

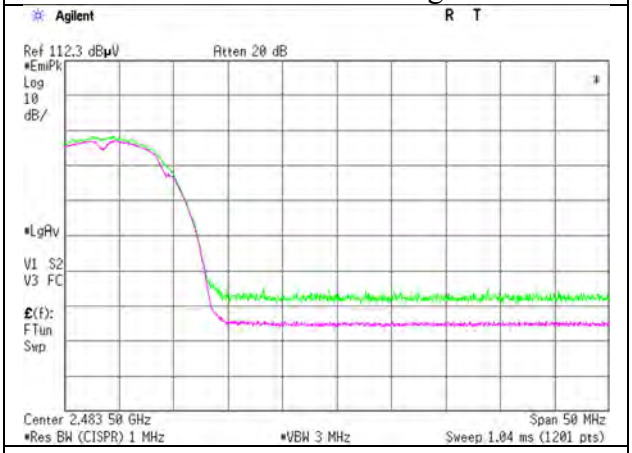
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

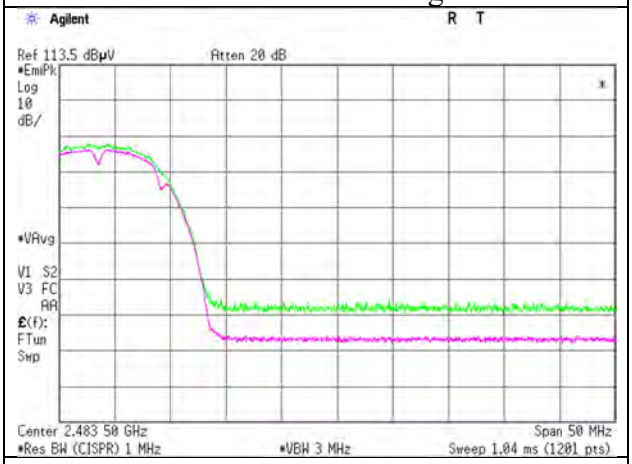
Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11b 2462 MHz

Horizontal
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11g 2412 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	50.78	27.26	14.15	36.58	2.33	57.94	73.90	15.9	158	280	
Hori.	2390.000	AV	38.35	27.26	14.15	36.58	2.33	45.51	53.90	8.4	158	280	
Vert.	2390.000	PK	54.11	27.26	14.15	36.58	2.33	61.27	73.90	12.6	144	310	
Vert.	2390.000	AV	41.35	27.26	14.15	36.58	2.33	48.51	53.90	**5.3**	144	310	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

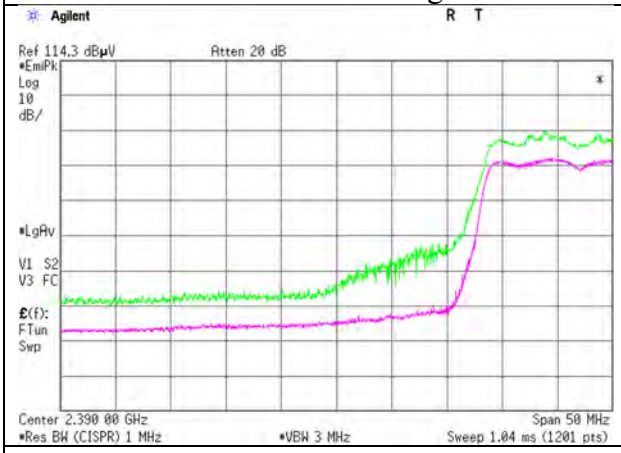
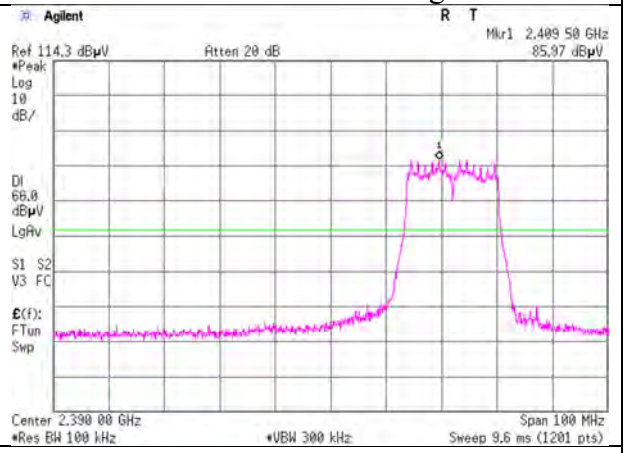
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	85.68	27.33	14.16	36.57	2.33	92.93	-	-	Carrier
Hori.	2400.000	PK	46.93	27.29	14.15	36.58	2.33	54.12	72.93	18.8	
Vert.	2412.000	PK	87.28	27.33	14.16	36.57	2.33	94.53	-	-	Carrier
Vert.	2400.000	PK	51.91	27.29	14.15	36.58	2.33	59.10	74.53	15.4	

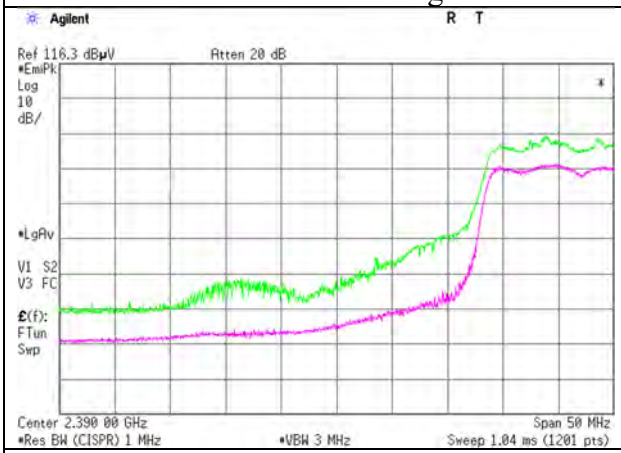
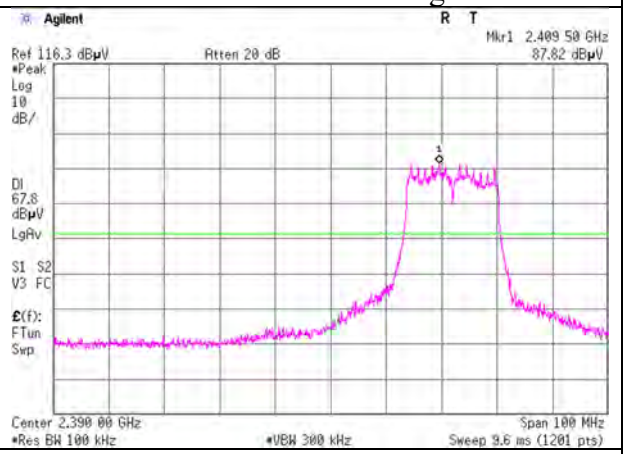
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11g 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11g 2462 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.84	27.55	14.25	36.52	2.33	57.45	73.90	16.4	155	295	
Hori.	2483.500	AV	36.61	27.55	14.25	36.52	2.33	44.22	53.90	9.6	155	295	
Vert.	2483.500	PK	51.45	27.55	14.25	36.52	2.33	59.06	73.90	14.8	157	290	
Vert.	2483.500	AV	37.32	27.55	14.25	36.52	2.33	44.93	53.90	**8.9**	157	290	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

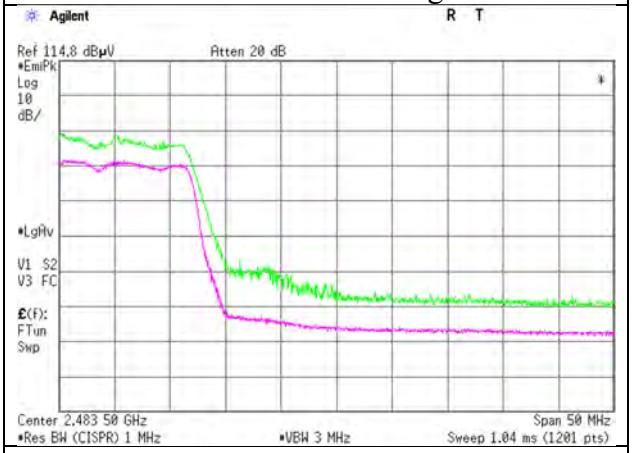
* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11g 2462 MHz

Horizontal

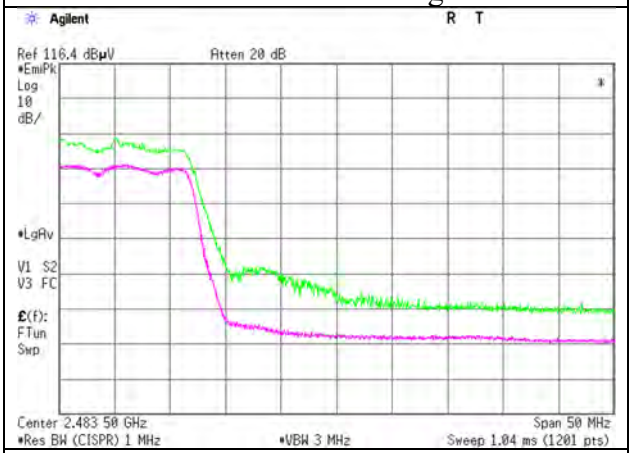
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11n-20 2412 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	51.82	27.26	14.15	36.58	2.33	58.98	73.90	14.9	152	279	
Hori.	2390.000	AV	39.11	27.26	14.15	36.58	2.33	46.27	53.90	7.6	152	279	
Vert.	2390.000	PK	52.26	27.26	14.15	36.58	2.33	59.42	73.90	14.4	159	322	
Vert.	2390.000	AV	39.56	27.26	14.15	36.58	2.33	46.72	53.90	**7.1**	159	322	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

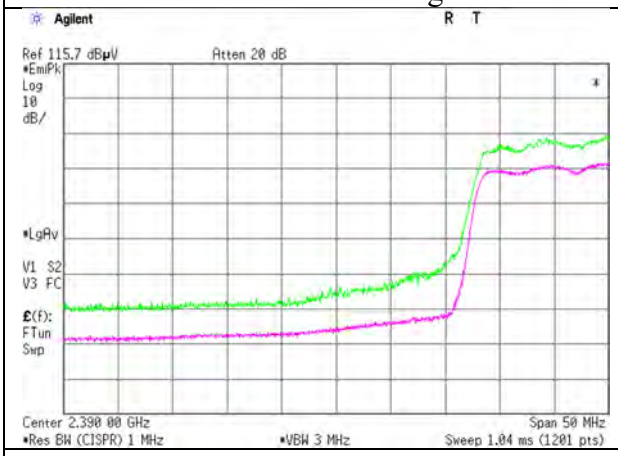
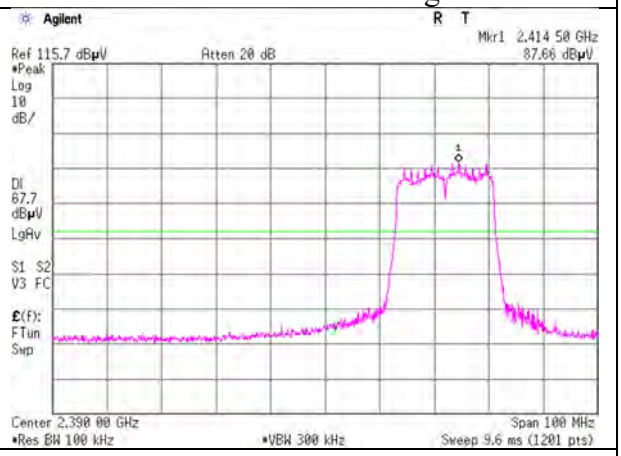
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	87.13	27.33	14.16	36.57	2.33	94.38	-	-	Carrier
Hori.	2400.000	PK	43.55	27.29	14.15	36.58	2.33	50.74	74.38	23.6	
Vert.	2412.000	PK	86.44	27.33	14.16	36.57	2.33	93.69	-	-	Carrier
Vert.	2400.000	PK	45.28	27.29	14.15	36.58	2.33	52.47	73.69	21.2	

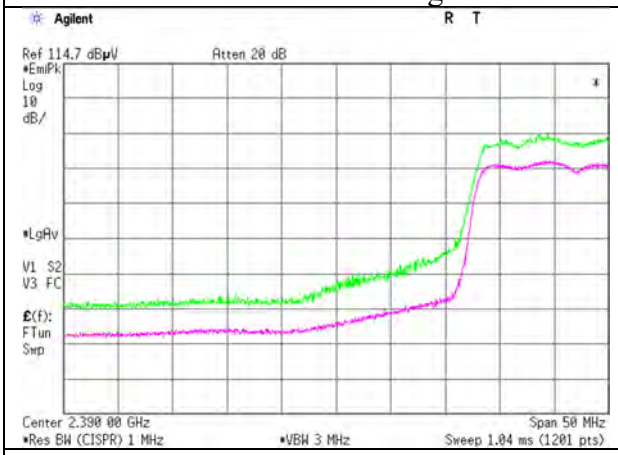
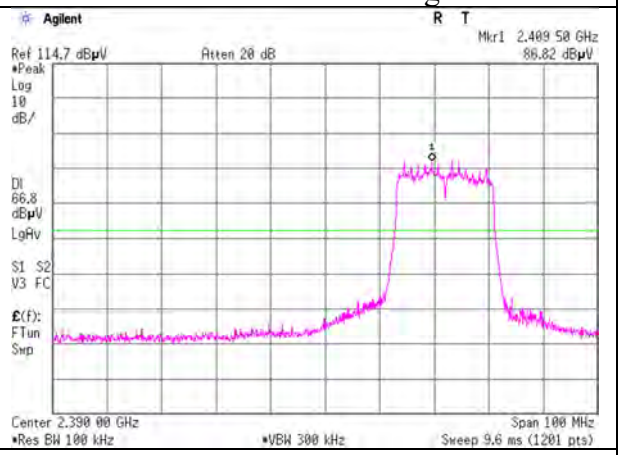
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11n-20 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 21, 2016	April 11, 2018
Temperature / Humidity	22 deg. C / 46 % RH	23 deg. C / 43 % RH
Engineer	Yosuke Ishikawa (30 MHz – 1 GHz) (13 GHz – 26.5 GHz)	Yasumasa Owaki (1 GHz – 13 GHz)
Antenna	1001932FT	
Mode	Tx 11n-20 2462 MHz	

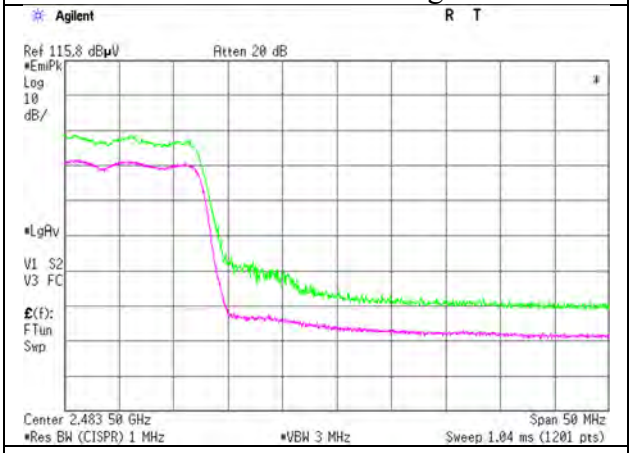
(* PK: Peak, AV: Average, QP: Quasi-Peak)

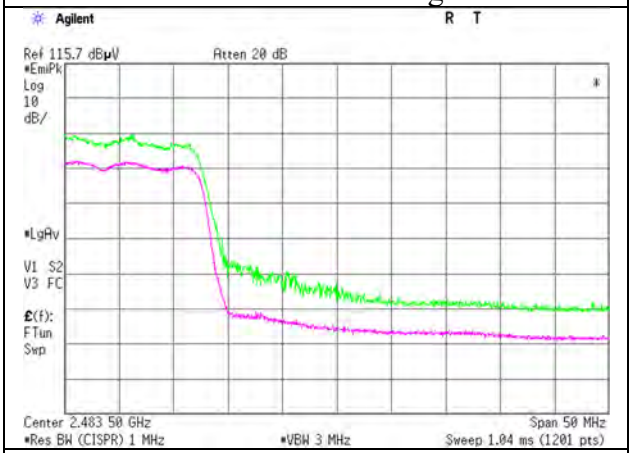
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	187.046	QP	22.07	16.12	7.97	32.09	0.00	14.07	43.50	29.4	100	1	
Hori.	258.672	QP	24.03	11.88	8.50	32.01	0.00	12.40	46.00	33.6	123	133	
Hori.	338.154	QP	23.23	14.11	8.92	31.96	0.00	14.30	46.00	31.7	132	174	
Hori.	613.310	QP	21.12	19.09	10.07	31.96	0.00	18.32	46.00	27.6	100	1	
Hori.	757.799	QP	21.22	20.12	10.57	31.78	0.00	20.13	46.00	25.8	100	2	
Hori.	2483.500	PK	49.96	27.55	14.25	36.52	2.33	57.57	73.90	16.3	160	261	
Hori.	4924.000	PK	50.23	31.73	6.71	36.92	2.33	54.08	73.90	19.8	148	258	
Hori.	7386.000	PK	44.13	36.88	8.26	37.54	2.33	54.06	73.90	19.8	150	1	
Hori.	9848.000	PK	44.97	38.90	9.36	38.76	2.33	56.80	73.90	17.1	150	1	
Hori.	2483.500	AV	38.47	27.55	14.25	36.52	2.33	46.08	53.90	7.8	160	261	
Hori.	4924.000	AV	40.78	31.73	6.71	36.92	2.33	44.63	53.90	9.2	148	258	
Hori.	7386.000	AV	34.69	36.88	8.26	37.54	2.33	44.62	53.90	9.2	150	1	
Hori.	9848.000	AV	36.21	38.90	9.36	38.76	2.33	48.04	53.90	**5.8**	150	1	
Vert.	158.619	QP	21.95	15.14	8.01	32.11	0.00	12.99	43.50	30.5	100	358	
Vert.	258.392	QP	31.48	11.87	8.50	32.01	0.00	19.84	46.00	26.1	102	91	
Vert.	338.187	QP	28.09	14.11	8.92	31.96	0.00	19.16	46.00	26.8	100	68	
Vert.	590.898	QP	21.29	18.89	9.99	31.96	0.00	18.21	46.00	27.7	100	1	
Vert.	861.628	QP	21.42	21.31	10.92	31.32	0.00	22.33	46.00	23.6	100	357	
Vert.	2483.500	PK	52.59	27.55	14.25	36.52	2.33	60.20	73.90	13.7	160	261	
Vert.	4924.000	PK	49.84	31.73	6.71	36.92	2.33	53.69	73.90	20.2	155	201	
Vert.	7386.000	PK	44.61	36.88	8.26	37.54	2.33	54.54	73.90	19.3	150	1	
Vert.	9848.000	PK	44.86	38.90	9.36	38.76	2.33	56.69	73.90	17.2	150	1	
Vert.	2483.500	AV	39.02	27.55	14.25	36.52	2.33	46.63	53.90	7.2	160	261	
Vert.	4924.000	AV	40.91	31.73	6.71	36.92	2.33	44.76	53.90	9.1	155	201	
Vert.	7386.000	AV	34.90	36.88	8.26	37.54	2.33	44.83	53.90	9.0	150	1	
Vert.	9848.000	AV	36.10	38.90	9.36	38.76	2.33	47.93	53.90	5.9	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 13 GHz)
Antenna	1001932FT
Mode	Tx 11n-20 2462 MHz

Horizontal
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 11, 2018	April 21, 2016
Temperature / Humidity	23 deg. C / 43 % RH	22 deg. C / 46 % RH
Engineer	Yasumasa Owaki	Yosuke Ishikawa
	(1 GHz – 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	1001932FT	
Mode	Tx 11n-40 2422 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	55.95	27.26	14.15	36.58	2.33	63.11	73.90	10.7	149	280	
Hori.	4844.000	PK	45.10	31.51	6.68	36.89	2.33	48.73	73.90	25.1	145	264	
Hori.	7266.000	PK	44.51	36.67	8.25	37.35	2.33	54.41	73.90	19.4	150	1	
Hori.	9688.000	PK	46.32	38.71	9.29	38.57	2.33	58.08	73.90	15.8	150	1	
Hori.	2390.000	AV	37.47	27.26	14.15	36.58	2.33	44.63	53.90	9.2	149	280	
Hori.	4844.000	AV	35.89	31.51	6.68	36.89	2.33	39.52	53.90	14.3	145	264	
Hori.	7266.000	AV	35.43	36.67	8.25	37.35	2.33	45.33	53.90	8.5	150	1	
Hori.	9688.000	AV	36.95	38.71	9.29	38.57	2.33	48.71	53.90	5.1	150	1	
Vert.	2390.000	PK	63.53	27.26	14.15	36.58	2.33	70.69	73.90	**3.2**	143	334	
Vert.	4844.000	PK	45.65	31.51	6.68	36.89	2.33	49.28	73.90	24.6	151	206	
Vert.	7266.000	PK	44.66	36.67	8.25	37.35	2.33	54.56	73.90	19.3	150	1	
Vert.	9688.000	PK	46.65	38.71	9.29	38.57	2.33	58.41	73.90	15.4	150	1	
Vert.	2390.000	AV	41.88	27.26	14.15	36.58	2.33	49.04	53.90	4.8	143	334	
Vert.	4844.000	AV	35.55	31.51	6.68	36.89	2.33	39.18	53.90	14.7	151	206	
Vert.	7266.000	AV	35.53	36.67	8.25	37.35	2.33	45.43	53.90	8.4	150	1	
Vert.	9688.000	AV	36.71	38.71	9.29	38.57	2.33	48.47	53.90	5.4	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

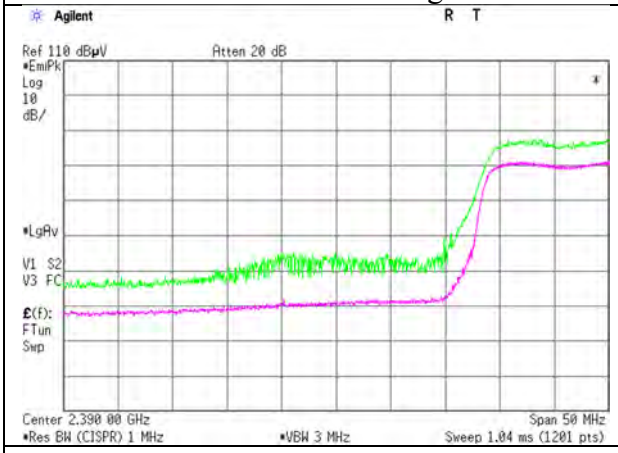
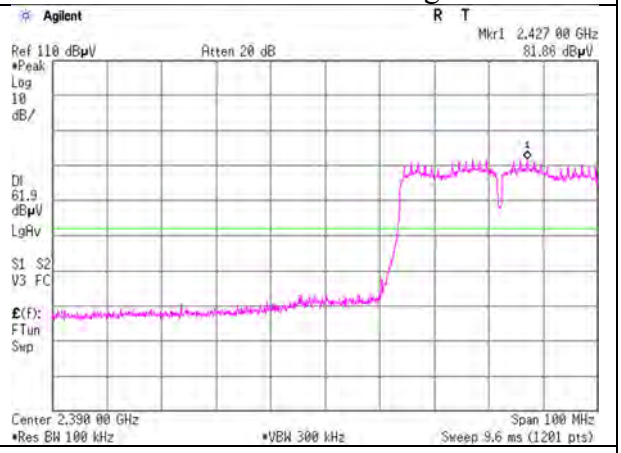
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

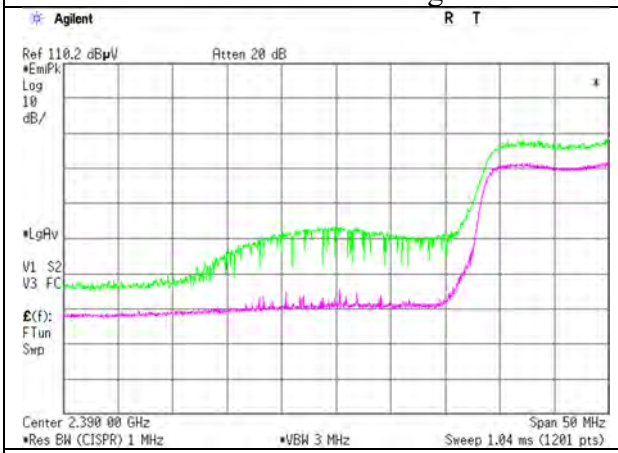
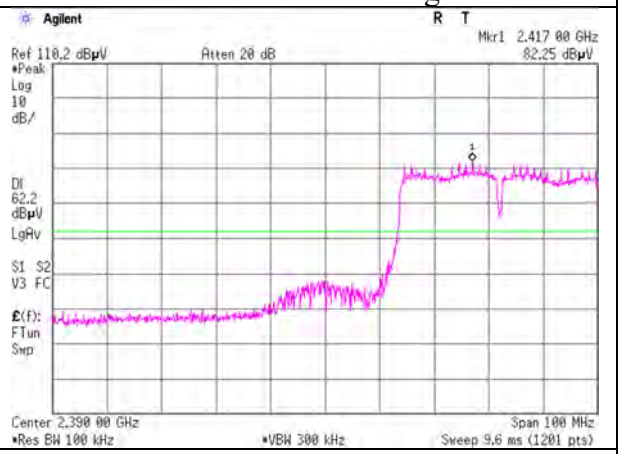
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2422.000	PK	81.92	27.36	14.18	36.56	2.33	89.23	-	-	Carrier
Hori.	2400.000	PK	44.58	27.29	14.15	36.58	2.33	51.77	69.23	17.5	
Vert.	2422.000	PK	81.96	27.36	14.18	36.56	2.33	89.27	-	-	Carrier
Vert.	2400.000	PK	45.07	27.29	14.15	36.58	2.33	52.26	69.27	17.0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 13 GHz)
Antenna	1001932FT
Mode	Tx 11n-40 2422 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11n-40 2452 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

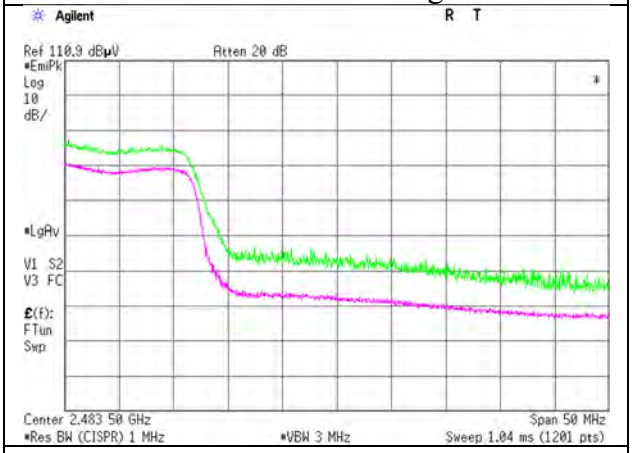
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	56.45	27.55	14.25	36.52	2.33	64.06	73.90	9.8	153	264	
Hori.	2483.500	AV	42.98	27.55	14.25	36.52	2.33	50.59	53.90	3.3	153	264	
Vert.	2483.500	PK	64.69	27.55	14.25	36.52	2.33	72.30	73.90	**1.6**	151	225	
Vert.	2483.500	AV	42.12	27.55	14.25	36.52	2.33	49.73	53.90	4.1	151	225	

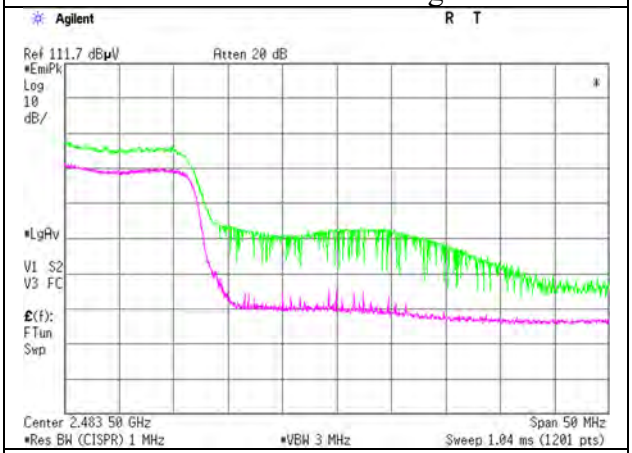
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 11, 2018
Temperature / Humidity	23 deg. C / 43 % RH
Engineer	Yasumasa Owaki (1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx 11n-40 2452 MHz

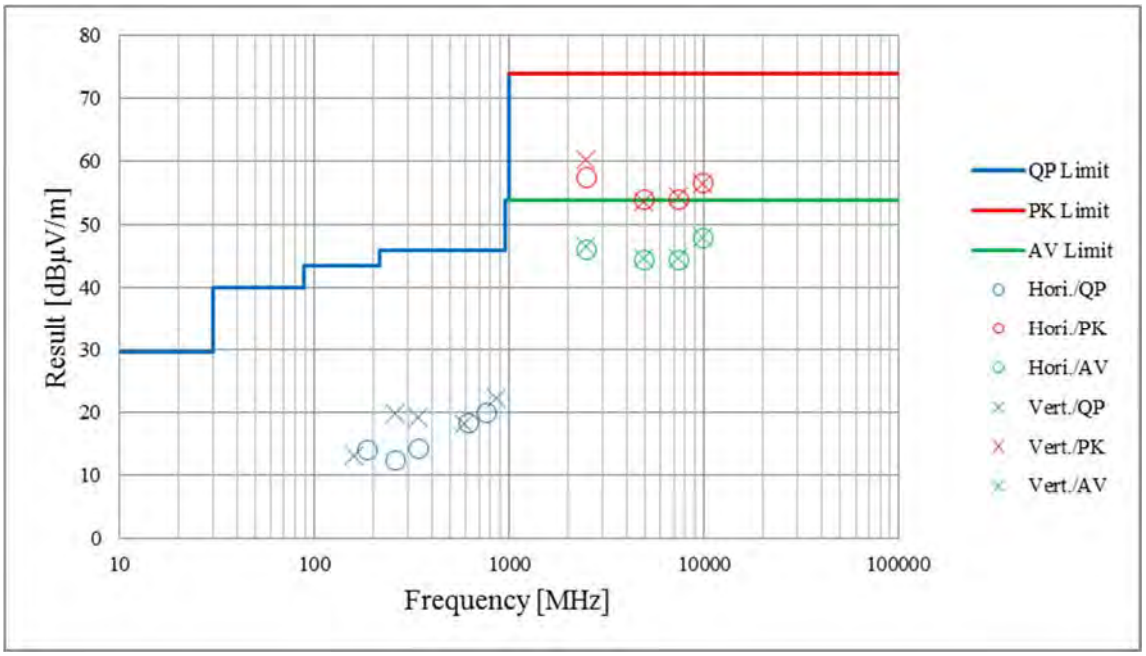
Horizontal
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 21, 2016	April 11, 2018
Temperature / Humidity	22 deg. C / 46 % RH	23 deg. C / 43 % RH
Engineer	Yosuke Ishikawa (30 MHz – 1 GHz) (13 GHz – 26.5 GHz)	Yasumasa Owaki (1 GHz – 13 GHz)
Antenna	1001932FT	
Mode	Tx 11n-20 2462 MHz	



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	March 19, 2018
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Kazutaka Takeyama
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx BT LE 2402 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	44.24	27.14	14.56	36.93	2.33	51.34	73.90	**22.5**	163	141	
Vert.	2390.000	PK	43.86	27.14	14.56	36.93	2.33	50.96	73.90	22.9	165	184	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	34.37	27.14	14.56	36.93	4.07	2.33	45.54	53.90	**8.4**	*1)
Vert.	2390.000	AV	34.32	27.14	14.56	36.93	4.07	2.33	45.49	53.90	**8.4**	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

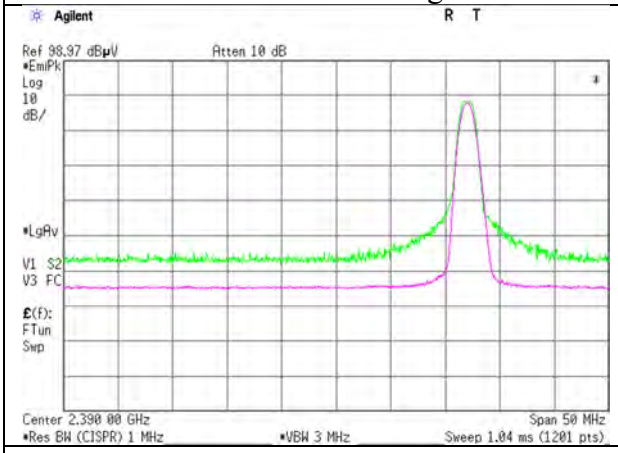
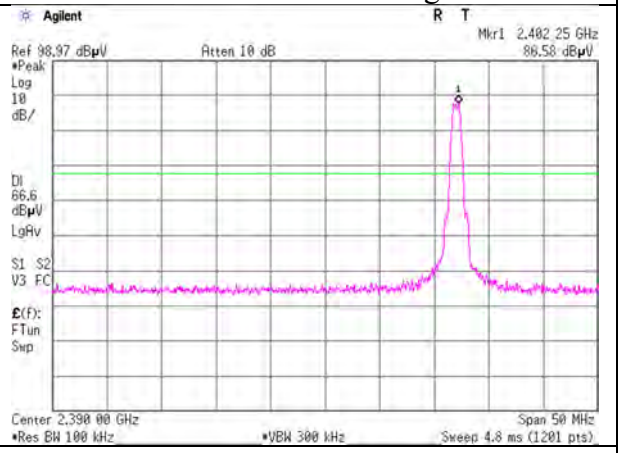
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	86.13	27.18	14.57	36.93	2.33	93.28	-	-	Carrier
Hori.	2400.000	PK	39.19	27.17	14.57	36.93	2.33	46.33	73.28	27.0	
Vert.	2402.000	PK	87.69	27.18	14.57	36.93	2.33	94.84	-	-	Carrier
Vert.	2400.000	PK	40.69	27.17	14.57	36.93	2.33	47.83	74.84	27.0	

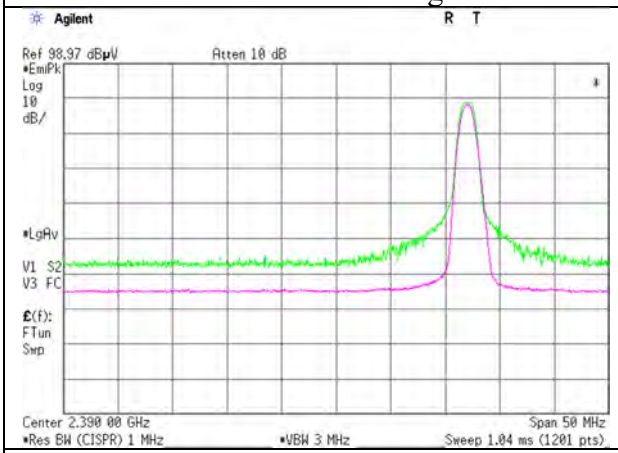
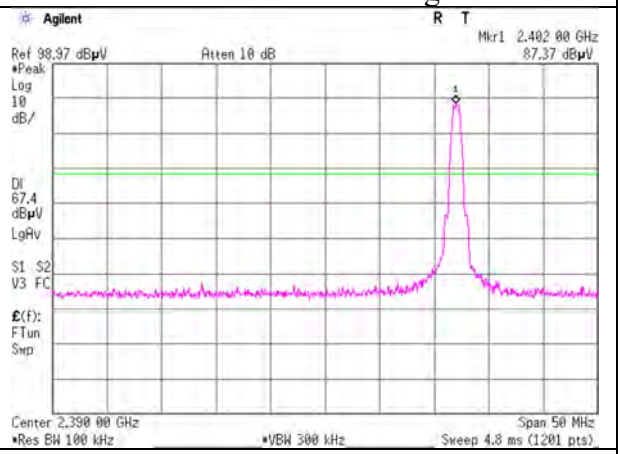
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	March 19, 2018
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Kazutaka Takeyama (1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx BT LE 2402 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	1	3
Date	April 7, 2018	March 19, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 52 % RH	21 deg. C / 31 % RH	23 deg. C / 39 % RH
Engineer	Makoto Hosaka	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz – 1 GHz)	(1 GHz – 2.8 GHz)	(2.8 GHz – 26.5 GHz)
Antenna	1001932FT		
Mode	Tx BT LE 2440 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	359.996	QP	22.68	14.57	9.03	31.95	0.00	14.33	46.00	31.6	100	1	
Hori.	479.993	QP	22.29	17.05	9.56	31.96	0.00	16.94	46.00	29.0	100	1	
Hori.	4880.000	PK	49.91	31.61	6.70	44.48	2.33	46.07	73.90	27.8	161	134	
Hori.	7320.000	PK	48.59	36.76	8.26	44.03	2.33	51.91	73.90	**21.9**	150	1	
Vert.	37.400	QP	23.09	15.13	6.77	32.20	0.00	12.79	40.00	27.2	100	1	
Vert.	70.245	QP	23.72	6.21	6.96	32.18	0.00	4.71	40.00	35.2	100	117	
Vert.	168.000	QP	22.67	15.54	8.03	32.10	0.00	14.14	43.50	29.3	100	78	
Vert.	239.998	QP	22.23	11.57	8.38	32.03	0.00	10.15	46.00	35.8	100	2	
Vert.	252.682	QP	22.18	11.67	8.46	32.01	0.00	10.30	46.00	35.7	100	1	
Vert.	328.661	QP	22.01	13.92	8.87	31.98	0.00	12.82	46.00	33.1	100	2	
Vert.	348.636	QP	26.74	14.33	8.97	31.95	0.00	18.09	46.00	27.9	100	184	
Vert.	479.993	QP	22.27	17.05	9.56	31.96	0.00	16.92	46.00	29.0	100	1	
Vert.	4880.000	PK	51.76	31.61	6.70	44.48	2.33	47.92	73.90	25.9	166	203	
Vert.	7320.000	PK	48.30	36.76	8.26	44.03	2.33	51.62	73.90	22.2	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	40.75	31.61	6.70	44.48	4.07	2.33	40.98	53.90	12.9	
Hori.	7320.000	AV	38.74	36.76	8.26	44.03	4.07	2.33	46.13	53.90	**7.8**	
Vert.	4880.000	AV	41.81	31.61	6.70	44.48	4.07	2.33	42.04	53.90	11.9	
Vert.	7320.000	AV	38.23	36.76	8.26	44.03	4.07	2.33	45.62	53.90	8.3	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	March 19, 2018
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Kazutaka Takeyama
	(1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx BT LE 2480 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	44.64	27.45	14.66	36.92	2.33	52.16	73.90	21.7	165	138	
Vert.	2483.500	PK	51.41	27.45	14.66	36.92	2.33	58.93	73.90	**14.9**	162	183	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

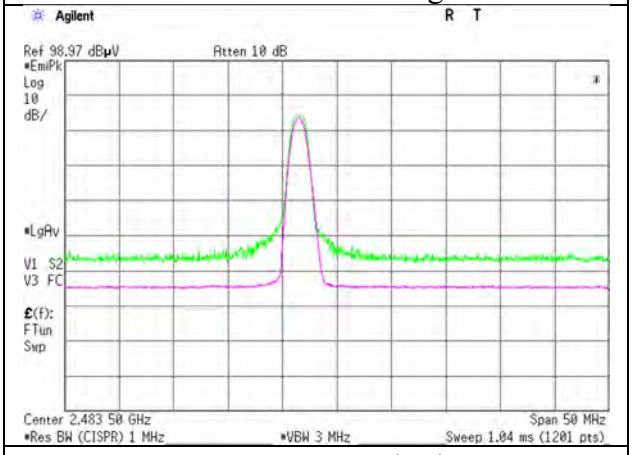
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	34.21	27.45	14.66	36.92	4.07	2.33	45.80	53.90	8.1	*1)
Vert.	2483.500	AV	35.09	27.45	14.66	36.92	4.07	2.33	46.68	53.90	**7.2**	*1)

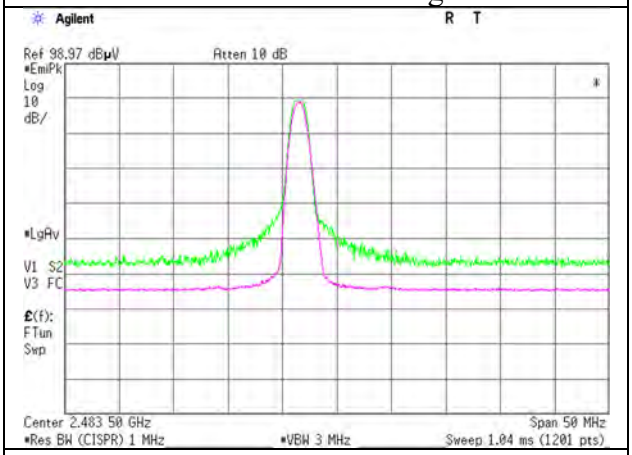
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.92 m / 3.0 m) = 2.33 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	1
Date	March 19, 2018
Temperature / Humidity	21 deg. C / 31 % RH
Engineer	Kazutaka Takeyama (1 GHz – 2.8 GHz)
Antenna	1001932FT
Mode	Tx BT LE 2480 MHz

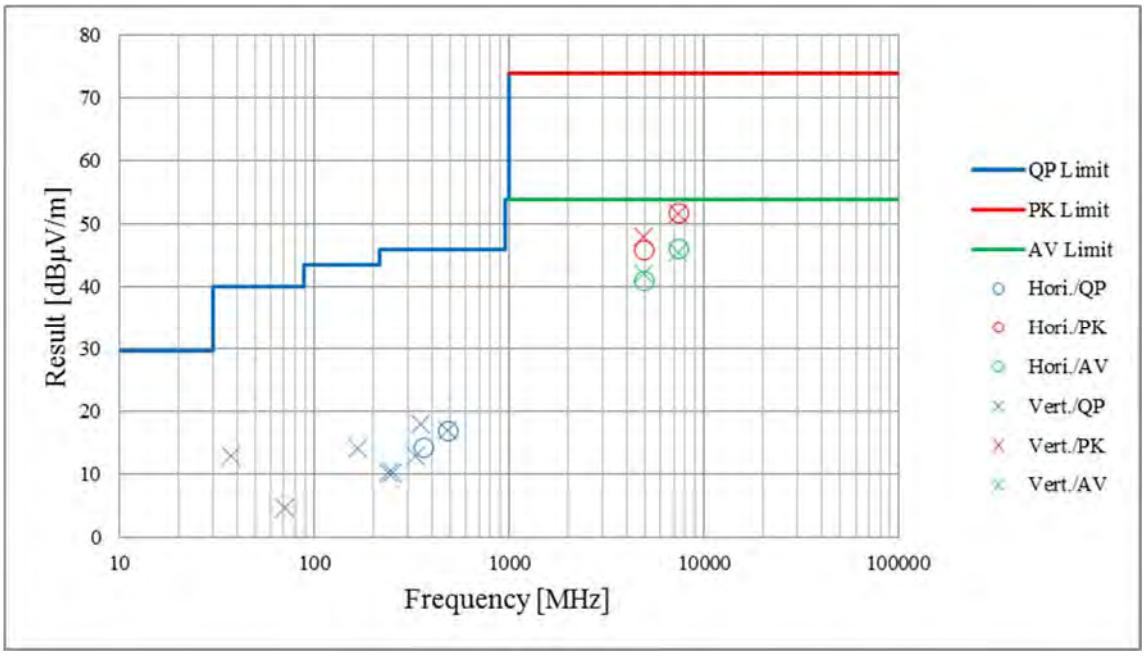
Horizontal
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12193629S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	1	3
Date	April 7, 2018	March 19, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 52 % RH	21 deg. C / 31 % RH	23 deg. C / 39 % RH
Engineer	Makoto Hosaka	Kazutaka Takeyama	Kazutaka Takeyama
	(30 MHz – 1 GHz)	(1 GHz – 2.8 GHz)	(2.8 GHz – 26.5 GHz)
Antenna	1001932FT		
Mode	Tx BT LE 2440 MHz		



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11b 2412 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	49.62	27.26	14.15	44.13	2.39	49.29	73.90	24.6	125	318	
Hori.	2390.000	AV	39.98	27.26	14.15	44.13	2.39	39.65	53.90	14.2	125	318	
Vert.	2390.000	PK	49.79	27.26	14.15	44.13	2.39	49.46	73.90	24.4	185	42	
Vert.	2390.000	AV	40.05	27.26	14.15	44.13	2.39	39.72	53.90	**14.1**	185	42	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

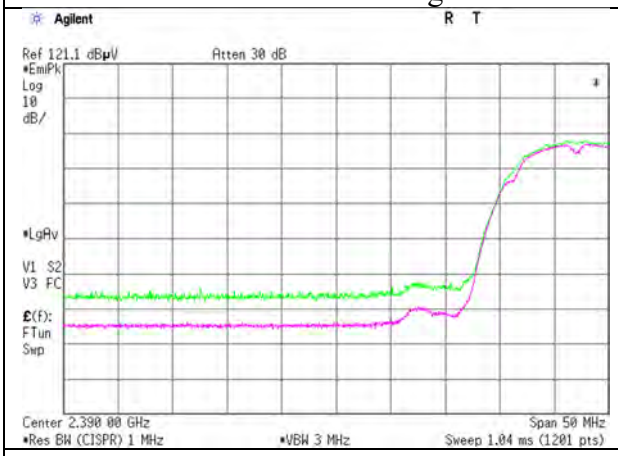
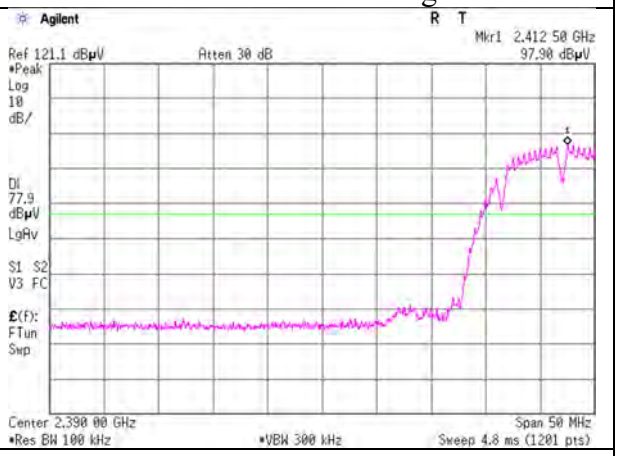
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	97.22	27.33	14.16	44.14	2.39	96.96	-	-	Carrier
Hori.	2400.000	PK	48.41	27.29	14.15	44.14	2.39	48.10	76.96	28.9	
Vert.	2412.000	PK	95.18	27.33	14.16	44.14	2.39	94.92	-	-	Carrier
Vert.	2400.000	PK	47.35	27.29	14.15	44.14	2.39	47.04	74.92	27.9	

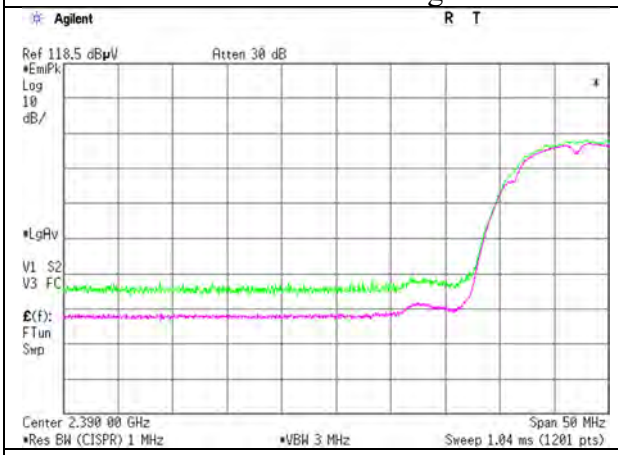
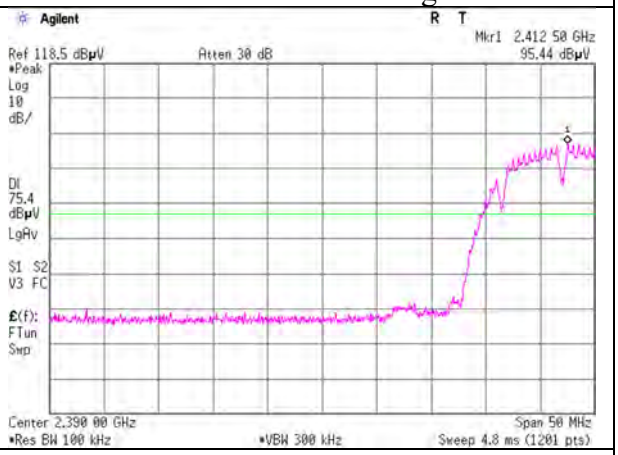
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki (1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11b 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11b 2462 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	49.92	27.55	14.25	44.16	2.39	49.95	73.90	23.9	141	336	
Hori.	2483.500	AV	40.45	27.55	14.25	44.16	2.39	40.48	53.90	13.4	141	336	
Vert.	2483.500	PK	49.87	27.55	14.25	44.16	2.39	49.90	73.90	24.0	147	39	
Vert.	2483.500	AV	40.74	27.55	14.25	44.16	2.39	40.77	53.90	**13.1**	147	39	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

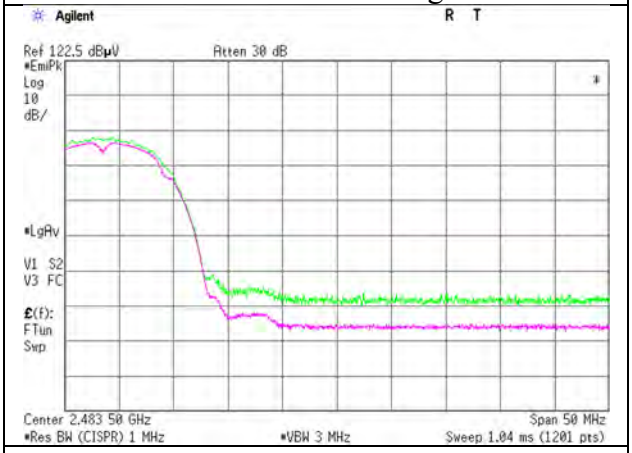
* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11b 2462 MHz

Horizontal

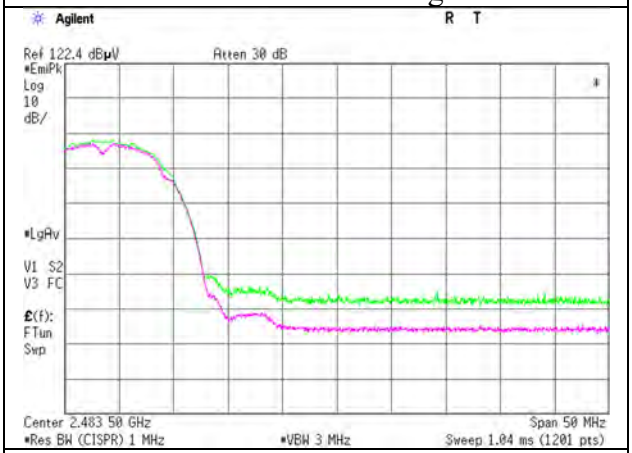
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11g 2412 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2381.500	PK	64.07	27.23	14.14	44.13	2.39	63.70	73.90	10.2	148	333	
Hori.	2390.000	PK	61.56	27.26	14.15	44.13	2.39	61.23	73.90	12.6	148	333	
Hori.	2381.500	AV	47.02	27.23	14.14	44.13	2.39	46.65	53.90	7.2	148	333	
Hori.	2390.000	AV	50.20	27.26	14.15	44.13	2.39	49.87	53.90	**4.0**	148	333	
Vert.	2381.500	PK	60.28	27.23	14.14	44.13	2.39	59.91	73.90	13.9	181	41	
Vert.	2390.000	PK	58.22	27.26	14.15	44.13	2.39	57.89	73.90	16.0	181	41	
Vert.	2381.500	AV	41.24	27.23	14.14	44.13	2.39	40.87	53.90	13.0	181	41	
Vert.	2390.000	AV	45.03	27.26	14.15	44.13	2.39	44.70	53.90	9.2	181	41	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

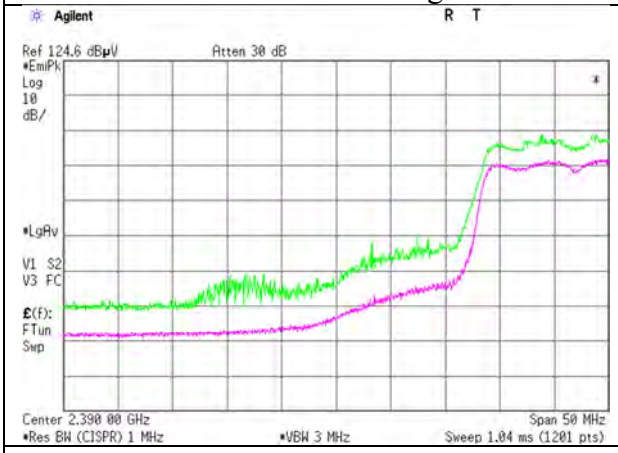
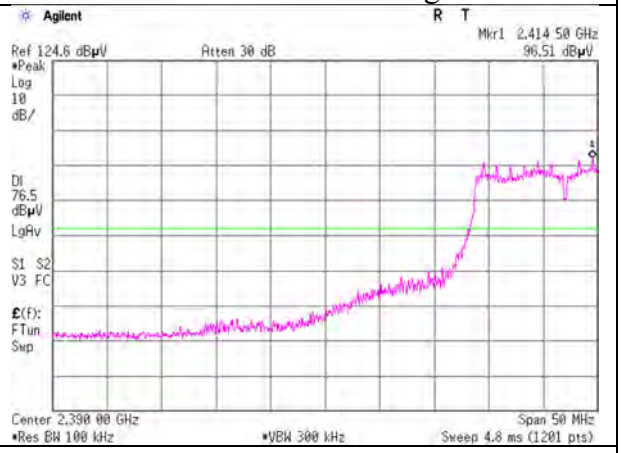
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	96.72	27.33	14.16	44.14	2.39	96.46	-	-	Carrier
Hori.	2400.000	PK	61.68	27.29	14.15	44.14	2.39	61.37	76.46	15.1	
Vert.	2412.000	PK	94.73	27.33	14.16	44.14	2.39	94.47	-	-	Carrier
Vert.	2400.000	PK	54.83	27.29	14.15	44.14	2.39	54.52	74.47	20.0	

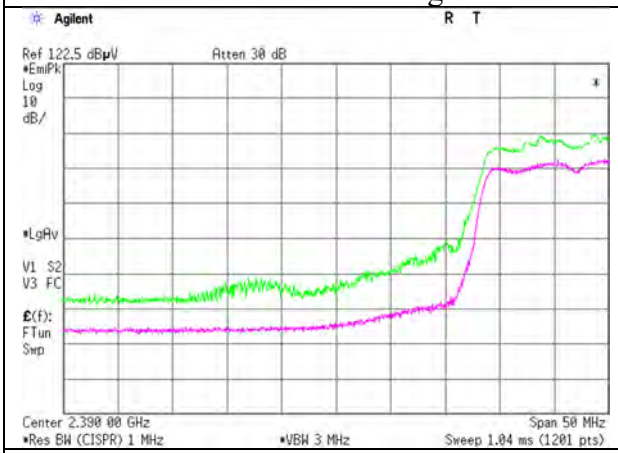
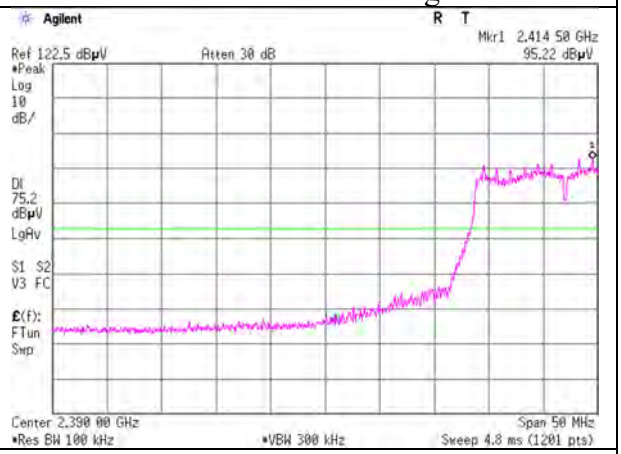
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11g 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11g 2462 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	63.45	27.55	14.25	44.16	2.39	63.48	73.90	10.4	148	327	
Hori.	2485.080	PK	65.86	27.55	14.25	44.16	2.39	65.89	73.90	8.0	148	327	
Hori.	2483.500	AV	47.66	27.55	14.25	44.16	2.39	47.69	53.90	6.2	148	327	
Hori.	2485.080	AV	49.34	27.55	14.25	44.16	2.39	49.37	53.90	4.5	148	327	
Vert.	2483.500	PK	64.70	27.55	14.25	44.16	2.39	64.73	73.90	9.1	139	40	
Vert.	2485.080	PK	60.81	27.55	14.25	44.16	2.39	60.84	73.90	13.0	139	40	
Vert.	2483.500	AV	50.18	27.55	14.25	44.16	2.39	50.21	53.90	**3.6**	139	40	
Vert.	2485.080	AV	47.68	27.55	14.25	44.16	2.39	47.71	53.90	6.1	139	40	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

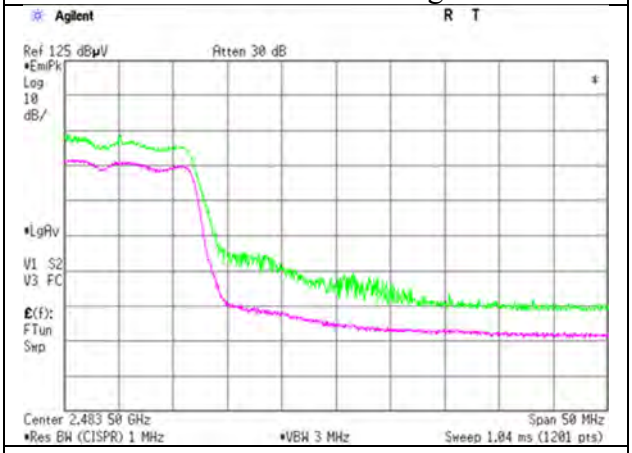
* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11g 2462 MHz

Horizontal

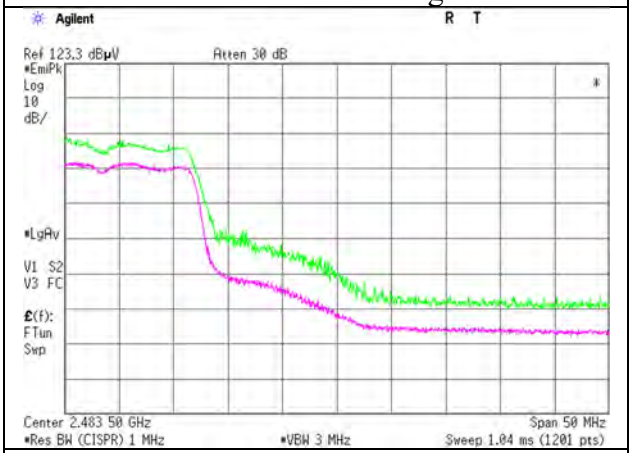
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11n-20 2412 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	60.30	27.26	14.15	44.13	2.39	59.97	73.90	13.9	142	302	
Hori.	2390.000	AV	45.26	27.26	14.15	44.13	2.39	44.93	53.90	8.9	142	302	
Vert.	2390.000	PK	62.21	27.26	14.15	44.13	2.39	61.88	73.90	12.0	187	53	
Vert.	2390.000	AV	48.10	27.26	14.15	44.13	2.39	47.77	53.90	**6.1**	187	53	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

20 dBc Data Sheet **(RBW 100 kHz, VBW 300 kHz)**

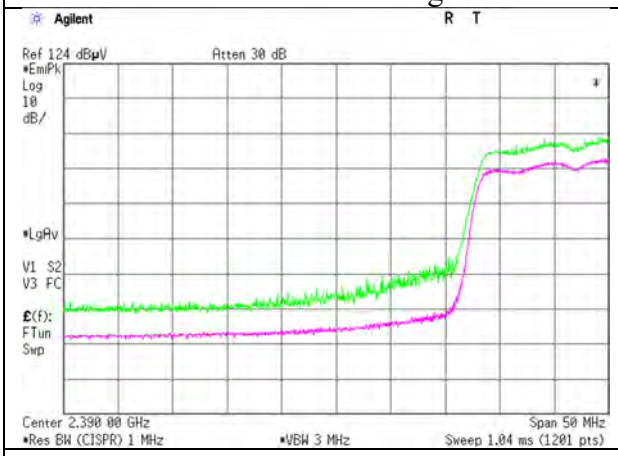
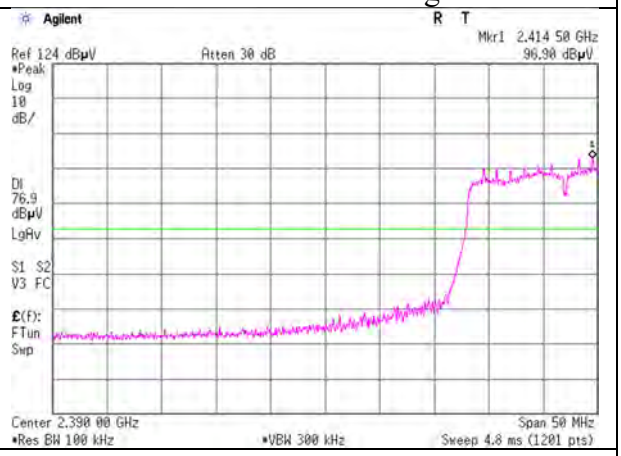
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2412.000	PK	95.99	27.33	14.16	44.14	2.39	95.73	-	-	Carrier
Hori.	2400.000	PK	53.86	27.29	14.15	44.14	2.39	53.55	75.73	22.2	
Vert.	2412.000	PK	92.12	27.33	14.16	44.14	2.39	91.86	-	-	Carrier
Vert.	2400.000	PK	59.16	27.29	14.15	44.14	2.39	58.85	71.86	13.0	

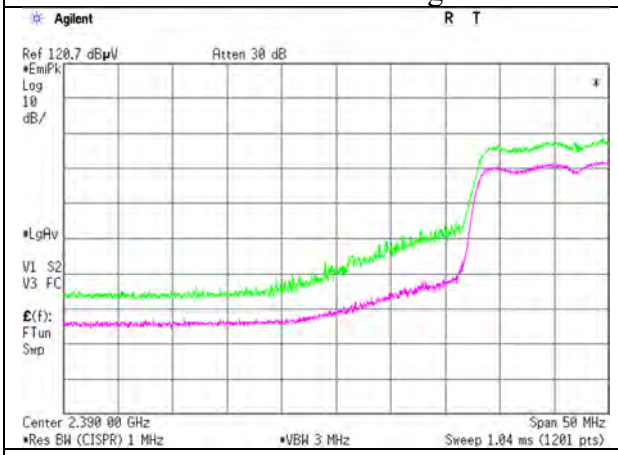
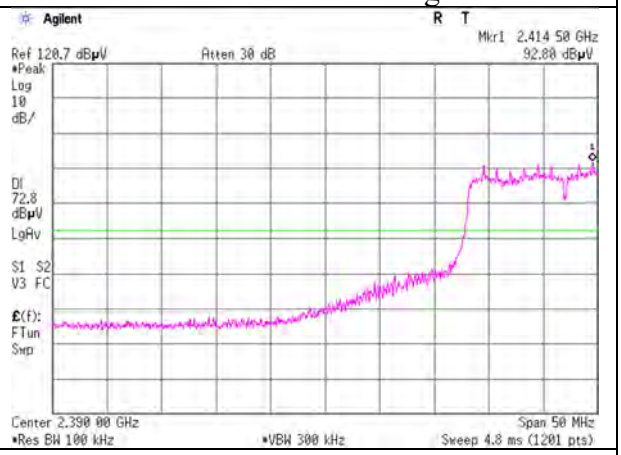
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11n-20 2412 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 21, 2016	April 9, 2018
Temperature / Humidity	22 deg. C / 46 % RH	23 deg. C / 26 % RH
Engineer	Yosuke Ishikawa (30 MHz – 1 GHz) (13 GHz – 26.5 GHz)	Yasumasa Owaki (1 GHz – 13 GHz)
Antenna	AH104N2450D1	
Mode	Tx 11n-20 2462 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	187.051	QP	22.01	16.12	7.97	32.09	0.00	14.01	43.50	29.4	100	2	
Hori.	258.678	QP	23.34	11.88	8.50	32.01	0.00	11.71	46.00	34.2	283	74	
Hori.	338.158	QP	23.12	14.11	8.92	31.96	0.00	14.19	46.00	31.8	122	313	
Hori.	613.305	QP	21.19	19.09	10.07	31.96	0.00	18.39	46.00	27.6	100	1	
Hori.	757.792	QP	21.23	20.12	10.57	31.78	0.00	20.14	46.00	25.8	100	3	
Hori.	2483.500	PK	66.92	27.55	14.25	44.16	2.39	66.95	73.90	6.9	137	328	
Hori.	4924.000	PK	53.33	31.73	6.85	44.49	2.39	49.81	73.90	24.0	142	22	
Hori.	7386.000	PK	47.92	36.88	8.57	44.06	2.39	51.70	73.90	22.2	150	1	
Hori.	9848.000	PK	48.44	38.90	9.48	43.86	2.39	55.35	73.90	18.5	150	1	
Hori.	2483.500	AV	50.51	27.55	14.25	44.16	2.39	50.54	53.90	**3.3**	137	328	
Hori.	4924.000	AV	42.69	31.73	6.85	44.49	2.39	39.17	53.90	14.7	142	22	
Hori.	7386.000	AV	39.32	36.88	8.57	44.06	2.39	43.10	53.90	10.8	150	1	
Hori.	9848.000	AV	39.62	38.90	9.48	43.86	2.39	46.53	53.90	7.3	150	1	
Vert.	158.621	QP	21.92	15.14	8.01	32.11	0.00	12.96	43.50	30.5	100	1	
Vert.	258.397	QP	28.15	11.87	8.50	32.01	0.00	16.51	46.00	29.4	105	87	
Vert.	338.188	QP	27.29	14.11	8.92	31.96	0.00	18.36	46.00	27.6	101	76	
Vert.	590.883	QP	21.28	18.89	9.99	31.96	0.00	18.20	46.00	27.8	100	1	
Vert.	861.623	QP	21.48	21.31	10.92	31.32	0.00	22.39	46.00	23.6	100	358	
Vert.	2483.500	PK	63.19	27.55	14.25	44.16	2.39	63.22	73.90	10.6	142	40	
Vert.	4924.000	PK	50.52	31.73	6.85	44.49	2.39	47.00	73.90	26.9	132	76	
Vert.	7386.000	PK	47.89	36.88	8.57	44.06	2.39	51.67	73.90	22.2	150	1	
Vert.	9848.000	PK	48.13	38.90	9.48	43.86	2.39	55.04	73.90	18.8	150	1	
Vert.	2483.500	AV	46.85	27.55	14.25	44.16	2.39	46.88	53.90	7.0	142	40	
Vert.	4924.000	AV	41.40	31.73	6.85	44.49	2.39	37.88	53.90	16.0	132	76	
Vert.	7386.000	AV	39.15	36.88	8.57	44.06	2.39	42.93	53.90	10.9	150	1	
Vert.	9848.000	AV	39.34	38.90	9.48	43.86	2.39	46.25	53.90	7.6	150	1	

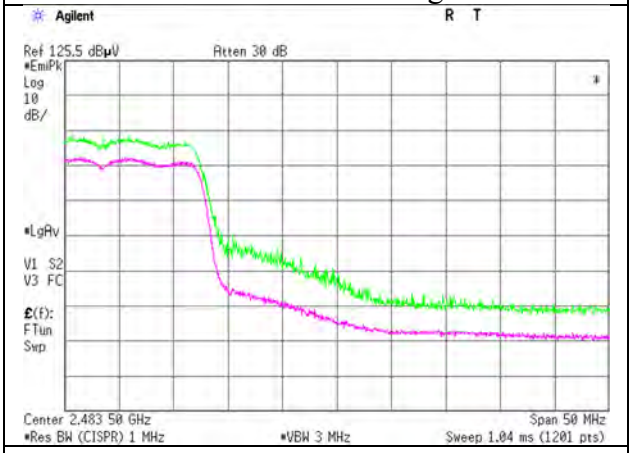
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 13 GHz)
Antenna	AH104N2450D1
Mode	Tx 11n-20 2462 MHz

Horizontal

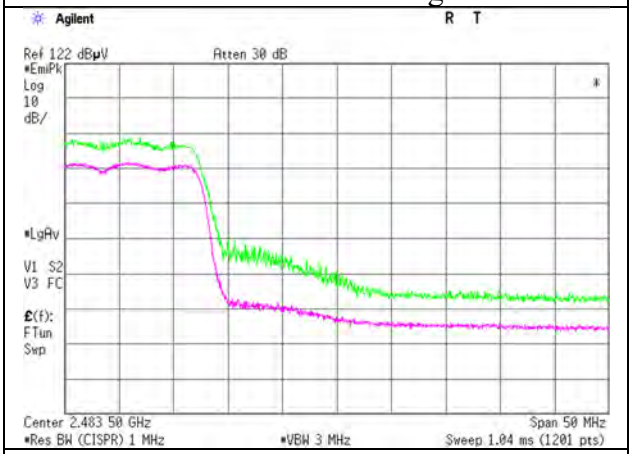
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 9, 2018	April 21, 2016
Temperature / Humidity	23 deg. C / 26 % RH	22 deg. C / 46 % RH
Engineer	Yasumasa Owaki	Yosuke Ishikawa
	(1 GHz – 13 GHz)	(13 GHz – 26.5 GHz)
Antenna	AH104N2450D1	
Mode	Tx 11n-40 2422 MHz	

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	58.82	27.26	14.15	44.13	2.39	58.49	73.90	15.4	140	306	
Hori.	4844.000	PK	50.18	31.51	6.78	44.46	2.39	46.40	73.90	27.5	138	18	
Hori.	7266.000	PK	47.53	36.67	8.47	44.01	2.39	51.05	73.90	22.8	150	1	
Hori.	9688.000	PK	48.42	38.71	9.34	43.84	2.39	55.02	73.90	18.8	150	1	
Hori.	2390.000	AV	46.04	27.26	14.15	44.13	2.39	45.71	53.90	**8.1**	140	306	
Hori.	4844.000	AV	41.01	31.51	6.78	44.46	2.39	37.23	53.90	16.6	138	18	
Hori.	7266.000	AV	38.27	36.67	8.47	44.01	2.39	41.79	53.90	12.1	150	1	
Hori.	9688.000	AV	38.89	38.71	9.34	43.84	2.39	45.49	53.90	8.4	150	1	
Vert.	2390.000	PK	55.56	27.26	14.15	44.13	2.39	55.23	73.90	18.6	188	52	
Vert.	4844.000	PK	50.53	31.51	6.78	44.46	2.39	46.75	73.90	27.1	129	85	
Vert.	7266.000	PK	47.86	36.67	8.47	44.01	2.39	51.38	73.90	22.5	150	1	
Vert.	9688.000	PK	48.13	38.71	9.34	43.84	2.39	54.73	73.90	19.1	150	1	
Vert.	2390.000	AV	44.83	27.26	14.15	44.13	2.39	44.50	53.90	9.4	188	52	
Vert.	4844.000	AV	41.49	31.51	6.78	44.46	2.39	37.71	53.90	16.1	129	85	
Vert.	7266.000	AV	38.16	36.67	8.47	44.01	2.39	41.68	53.90	12.2	150	1	
Vert.	9688.000	AV	38.83	38.71	9.34	43.84	2.39	45.43	53.90	8.4	150	1	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

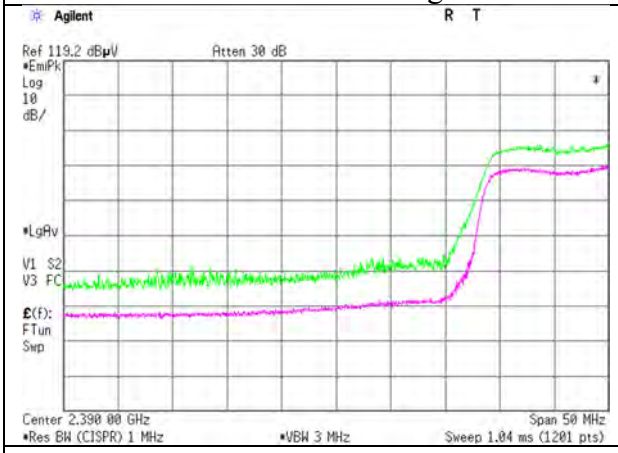
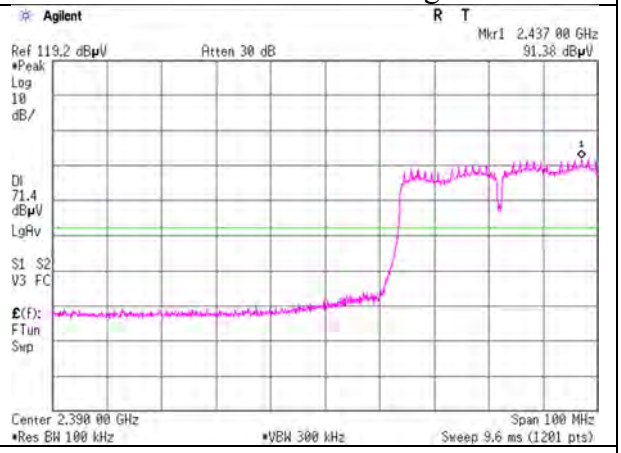
20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

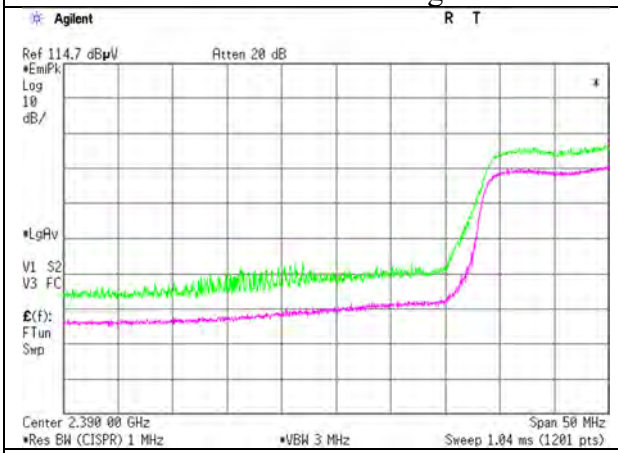
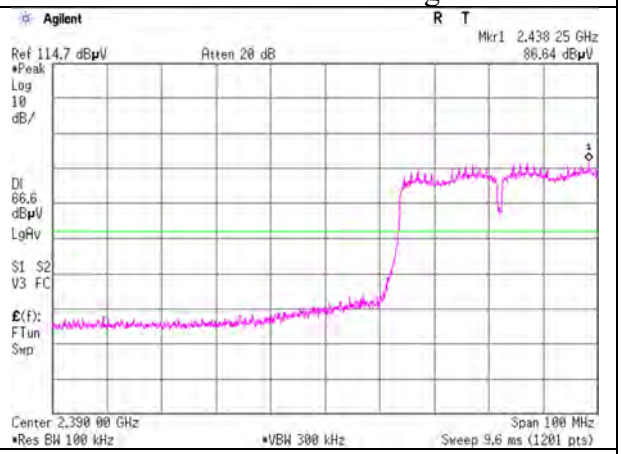
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2422.000	PK	90.74	27.36	14.18	44.14	2.39	90.53	-	-	Carrier
Hori.	2400.000	PK	50.10	27.29	14.15	44.14	2.39	49.79	70.53	20.7	
Vert.	2422.000	PK	86.56	27.36	14.18	44.14	2.39	86.35	-	-	Carrier
Vert.	2400.000	PK	46.47	27.29	14.15	44.14	2.39	46.16	66.35	20.2	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 13 GHz)
Antenna	AH104N2450D1
Mode	Tx 11n-40 2422 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11n-40 2452 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	68.26	27.55	14.25	44.16	2.39	68.29	73.90	5.6	141	304	
Hori.	2483.500	AV	50.40	27.55	14.25	44.16	2.39	50.43	53.90	**3.4**	141	304	
Vert.	2483.500	PK	66.93	27.55	14.25	44.16	2.39	66.96	73.90	6.9	185	31	
Vert.	2483.500	AV	47.59	27.55	14.25	44.16	2.39	47.62	53.90	6.2	185	31	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

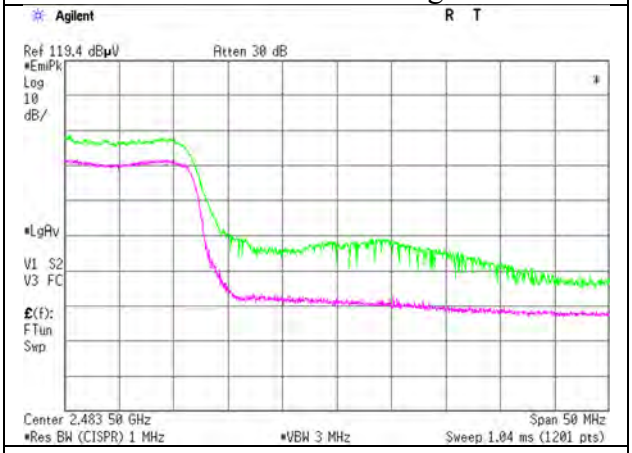
* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	April 9, 2018
Temperature / Humidity	23 deg. C / 26 % RH
Engineer	Yasumasa Owaki (1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx 11n-40 2452 MHz

Horizontal

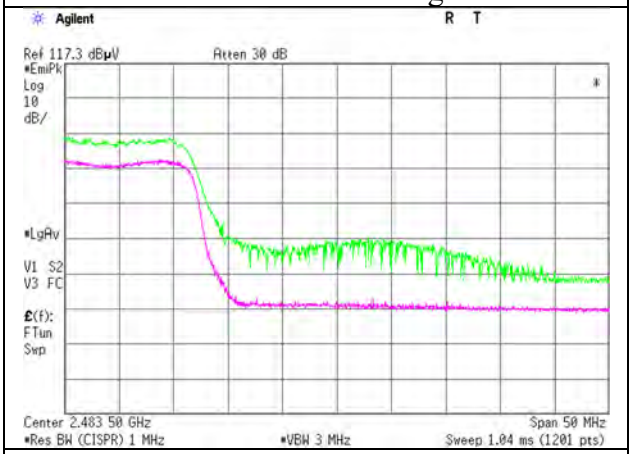
Restricted-band band-edge Plot



Trace Green : Peak Plot
Trace Purple : Average Plot

Vertical

Restricted-band band-edge Plot

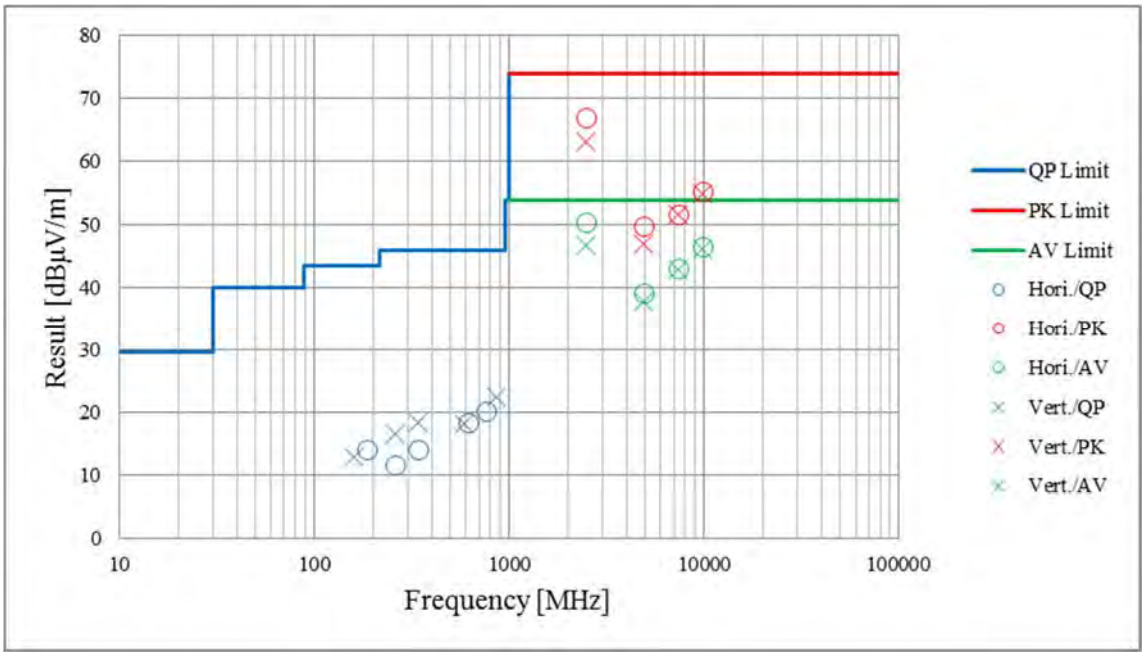


Trace Green : Peak Plot
Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12193629S-A-R2	
Test place	Shonan EMC Lab.	
Semi Anechoic Chamber	3	3
Date	April 21, 2016	April 9, 2018
Temperature / Humidity	22 deg. C / 46 % RH	23 deg. C / 26 % RH
Engineer	Yosuke Ishikawa (30 MHz – 1 GHz) (13 GHz – 26.5 GHz)	Yasumasa Owaki (1 GHz – 13 GHz)
Antenna	AH104N2450D1	
Mode	Tx 11n-20 2462 MHz	



*These plots data contains sufficient number to show the trend of characteristic features for EUT.

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 20, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx BT LE 2402 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2390.000	PK	49.29	27.26	14.19	44.13	2.39	49.00	73.90	**24.9**	166	131	
Vert.	2390.000	PK	48.61	27.26	14.19	44.13	2.39	48.32	73.90	25.5	147	195	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2390.000	AV	39.68	27.26	14.19	44.13	4.07	2.39	43.46	53.90	**10.4**	*1)
Vert.	2390.000	AV	39.57	27.26	14.19	44.13	4.07	2.39	43.35	53.90	10.6	*1)

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

20 dBc Data Sheet (RBW 100 kHz, VBW 300 kHz)

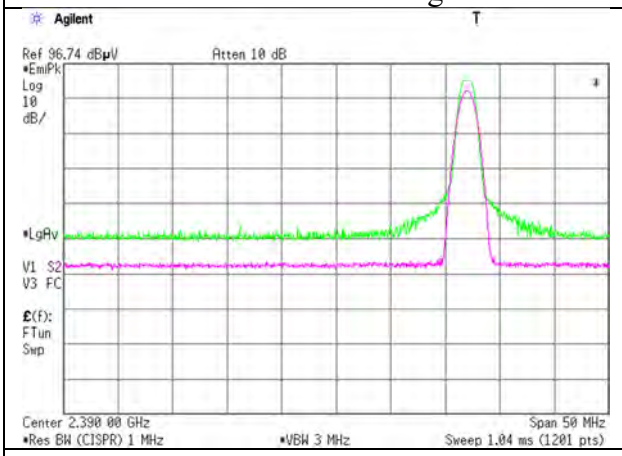
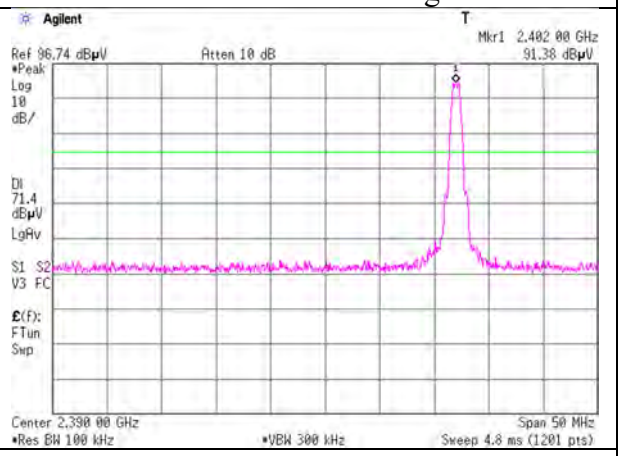
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2402.000	PK	91.19	27.29	14.20	44.14	2.39	90.93	-	-	Carrier
Hori.	2400.000	PK	43.48	27.29	14.19	44.14	2.39	43.21	70.93	27.7	
Vert.	2402.000	PK	87.07	27.29	14.20	44.14	2.39	86.81	-	-	Carrier
Vert.	2400.000	PK	42.60	27.29	14.19	44.14	2.39	42.33	66.81	24.5	

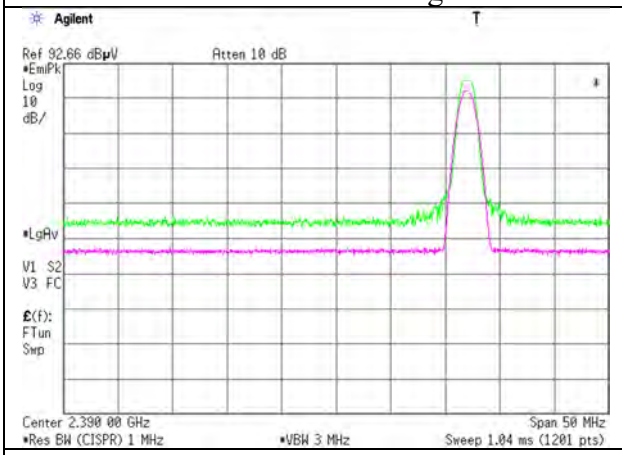
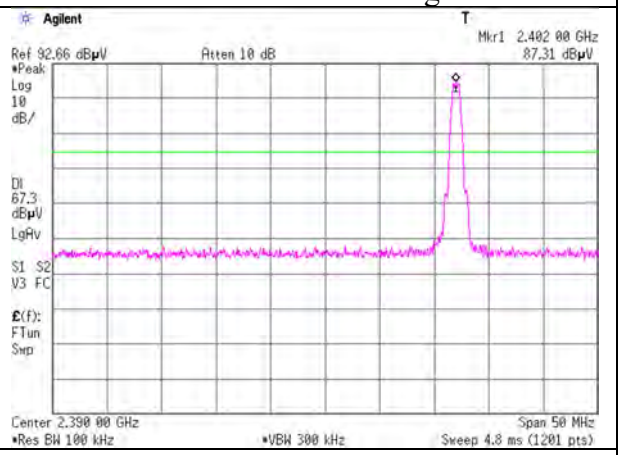
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 20, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx BT LE 2402 MHz

Horizontal	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

Vertical	
Restricted-band band-edge Plot	Authorized-band band-edge Plot
	
Trace Green : Peak Plot Trace Purple : Average Plot	20dBc Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission

Report No.	12193629S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	April 7, 2018	March 20, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 52 % RH	22 deg. C / 40 % RH	23 deg. C / 39 % RH
Engineer	Makoto Hosaka (30 MHz – 1 GHz)	Hiroyuki Morikawa (1 GHz – 18 GHz)	Kazutaka Takeyama (18 GHz – 26.5 GHz)
Antenna	AH104N2450D1		
Mode	Tx BT LE 2440 MHz		

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	359.998	QP	22.41	14.57	9.03	31.95	0.00	14.06	46.00	31.9	100	2	
Hori.	480.002	QP	22.08	17.05	9.56	31.96	0.00	16.73	46.00	29.2	100	1	
Hori.	4880.000	PK	50.01	31.61	6.70	44.48	2.39	46.23	73.90	27.6	145	226	
Hori.	7320.000	PK	47.45	36.76	8.26	44.03	2.39	50.83	73.90	23.0	150	0	
Vert.	37.400	QP	22.89	15.13	6.77	32.20	0.00	12.59	40.00	27.4	100	2	
Vert.	70.245	QP	23.32	6.21	6.96	32.18	0.00	4.31	40.00	35.6	100	1	
Vert.	168.000	QP	22.19	15.54	8.03	32.10	0.00	13.66	43.50	29.8	100	1	
Vert.	239.996	QP	22.24	11.57	8.38	32.03	0.00	10.16	46.00	35.8	100	1	
Vert.	252.683	QP	21.97	11.67	8.46	32.01	0.00	10.09	46.00	35.9	100	2	
Vert.	328.665	QP	21.95	13.92	8.87	31.98	0.00	12.76	46.00	33.2	100	1	
Vert.	479.998	QP	22.09	17.05	9.56	31.96	0.00	16.74	46.00	29.2	100	1	
Vert.	4880.000	PK	50.84	31.61	6.70	44.48	2.39	47.06	73.90	26.8	150	153	
Vert.	7320.000	PK	47.61	36.76	8.26	44.03	2.39	50.99	73.90	**22.9**	150	0	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	4880.000	AV	41.09	31.61	6.70	44.48	4.07	2.39	41.38	53.90	12.5	
Hori.	7320.000	AV	38.95	36.76	8.26	44.03	4.07	2.39	46.40	53.90	**7.5**	
Vert.	4880.000	AV	41.37	31.61	6.70	44.48	4.07	2.39	41.66	53.90	12.2	
Vert.	7320.000	AV	38.55	36.76	8.26	44.03	4.07	2.39	46.00	53.90	7.9	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

Radiated Spurious Emission

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 20, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa
	(1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx BT LE 2480 MHz

(* PK: Peak, AV: Average, QP: Quasi-Peak)

Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Height [cm]	Angle [deg]	Remark
Hori.	2483.500	PK	57.84	27.55	14.29	44.16	2.39	57.91	73.90	**15.9**	242	154	
Vert.	2483.500	PK	56.34	27.55	14.29	44.16	2.39	56.41	73.90	17.4	328	133	

Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB

Average measurement value with duty factor

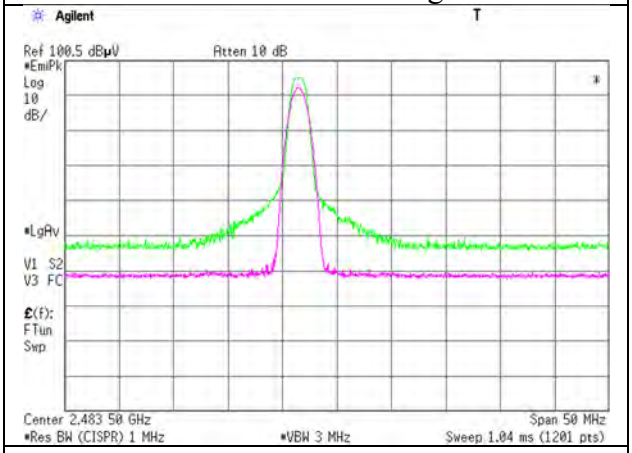
Polarity	Frequency [MHz]	Detector	Reading [dBuV]	Ant.Fac. [dB/m]	Loss [dB]	Gain [dB]	Duty Factor [dB]	Distance Factor [dB]	Result [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
Hori.	2483.500	AV	40.71	27.55	14.29	44.16	4.07	2.39	44.85	53.90	**9.1**	*1)
Vert.	2483.500	AV	40.35	27.55	14.29	44.16	4.07	2.39	44.49	53.90	9.4	*1)

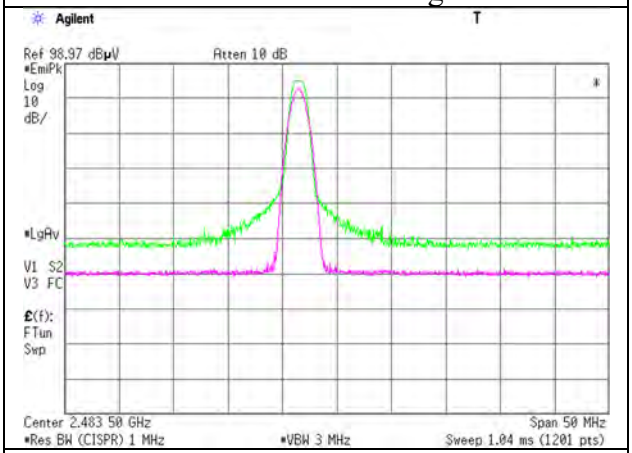
Result = Reading + Ant.Fac. + Loss (Cable+(Attenuator or Filter)(below 18 GHz)) - Gain(Amprifier) + Duty factor + Distance factor
Distance factor : 1 GHz - 13 GHz : 20log (3.95 m / 3.0 m) = 2.39 dB
13 GHz - 40 GHz : 20log (1.0 m / 3.0 m) = -9.54 dB
Duty factor refer to "Duty factor Calculation chart" sheet.
*1) Not out of band emission (Leakage Power)

* This mode was performed only band edges measurement.

Radiated Spurious Emission
(Reference Plot for band-edge)

Report No.	12193629S-A-R2
Test place	Shonan EMC Lab.
Semi Anechoic Chamber	3
Date	March 20, 2018
Temperature / Humidity	22 deg. C / 40 % RH
Engineer	Hiroyuki Morikawa (1 GHz – 2.8 GHz)
Antenna	AH104N2450D1
Mode	Tx BT LE 2480 MHz

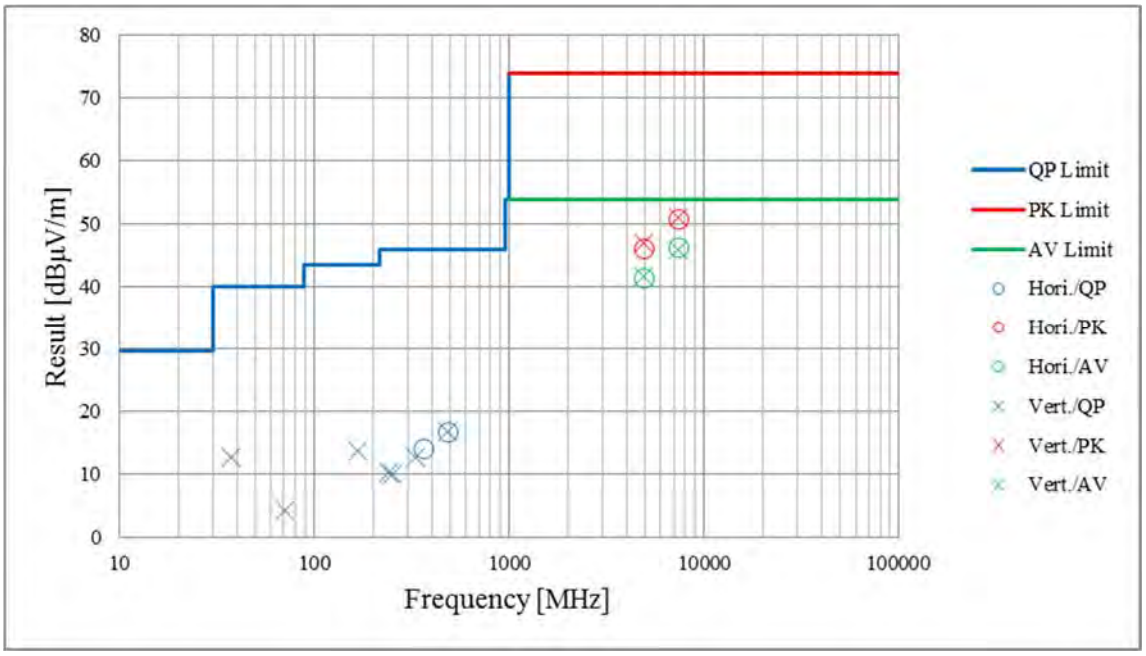
Horizontal
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

Vertical
Restricted-band band-edge Plot

Trace Green : Peak Plot Trace Purple : Average Plot

* Final result of restricted band edge was shown in tabular data.

Radiated Spurious Emission
(Plot data, Worst case)

Report No.	12193629S-A-R2		
Test place	Shonan EMC Lab.		
Semi Anechoic Chamber	3	3	3
Date	April 7, 2018	March 20, 2018	March 20, 2018
Temperature / Humidity	23 deg. C / 52 % RH	22 deg. C / 40 % RH	23 deg. C / 39 % RH
Engineer	Makoto Hosaka	Hiroyuki Morikawa	Kazutaka Takeyama
	(30 MHz – 1 GHz)	(1 GHz – 18 GHz)	(18 GHz – 26.5 GHz)
Antenna	AH104N2450D1		
Mode	Tx BT LE 2440 MHz		

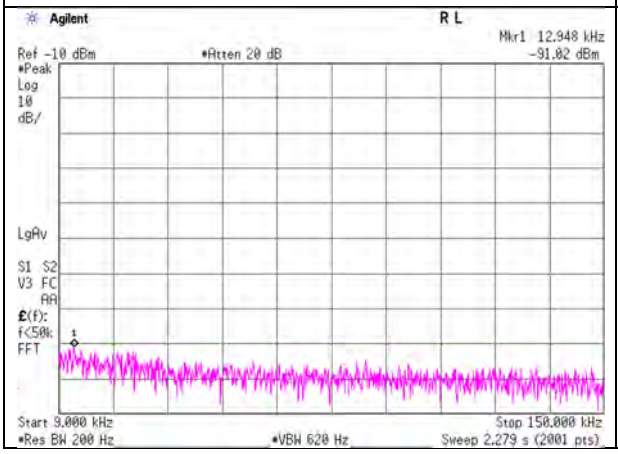


*These plots data contains sufficient number to show the trend of characteristic features for EUT.

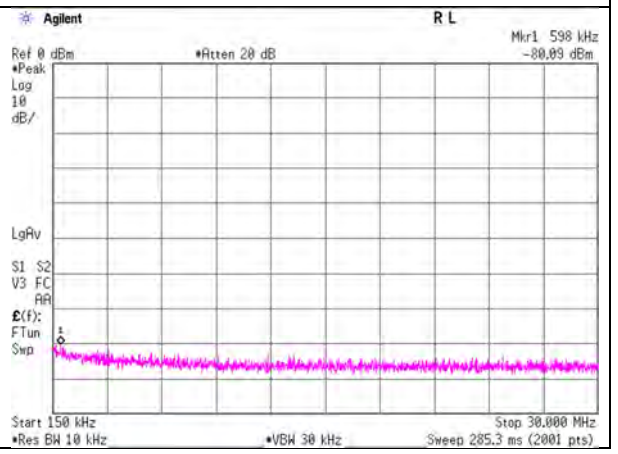
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.5 Shielded Room
Report No.	12193629S-A-R2
Date	April 11, 2018
Temperature / Humidity	25 deg. C / 32 % RH
Engineer	Kazuya Noda
Mode	Tx 11n-20 2462 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
12.95	-91.0	0.01	9.8	2.5	1	-78.7	300	6.0	-17.5	45.3	62.8	
598.00	-80.1	0.01	9.8	2.5	1	-67.8	30	6.0	13.5	32.0	18.5	

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

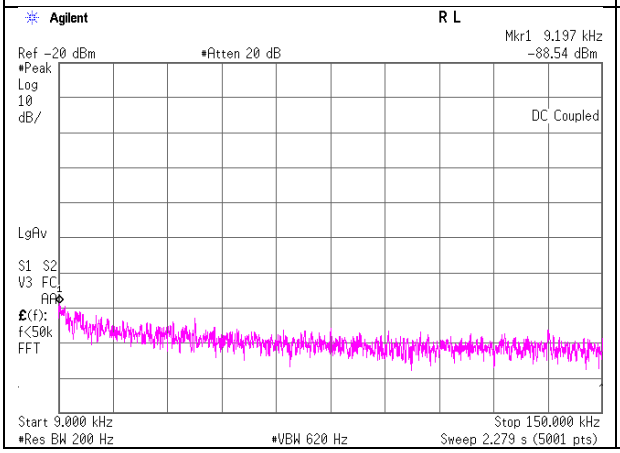
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

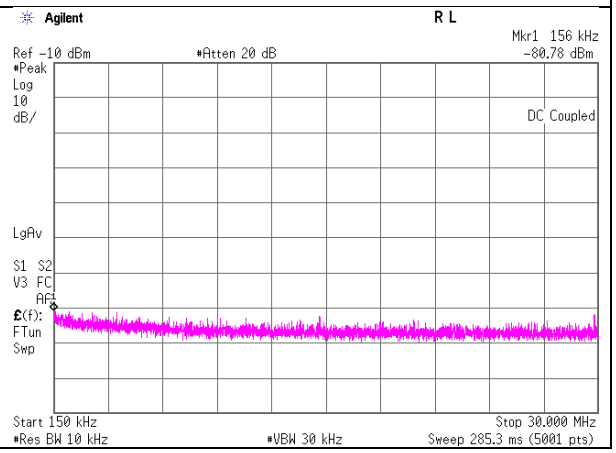
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	12193629S-A-R2
Date	March 30, 2018
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx BT LE 2402 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
9.20	-88.5	0.01	9.8	2.5	1	-76.2	300	6.0	-15.0	48.3	63.3	
156.00	-80.8	0.01	9.8	2.5	1	-68.5	300	6.0	-7.2	23.7	30.9	

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

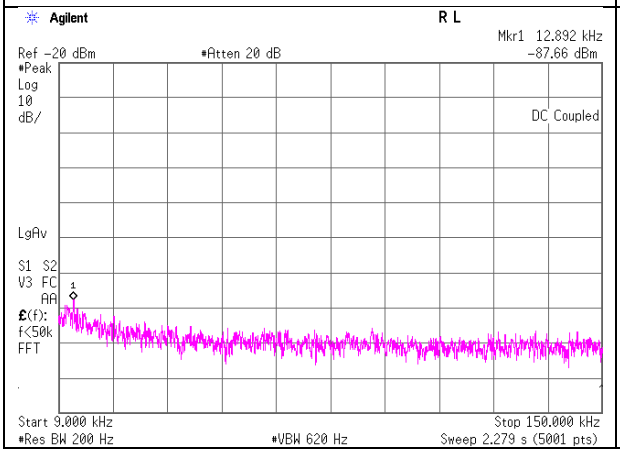
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

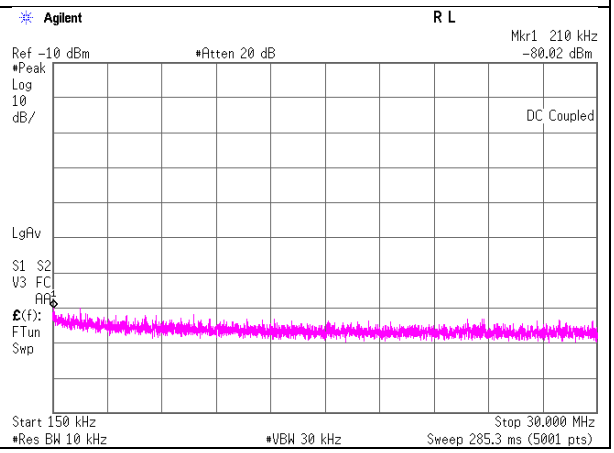
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	12193629S-A-R2
Date	March 30, 2018
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx BT LE 2440 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
12.89	-87.7	0.01	9.8	2.5	1	-75.4	300	6.0	-14.1	45.3	59.4	
210.00	-80.0	0.01	9.8	2.5	1	-67.7	300	6.0	-6.5	21.1	27.6	

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

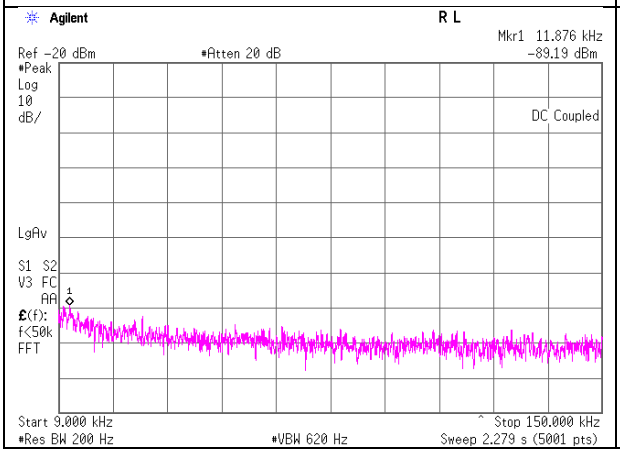
EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

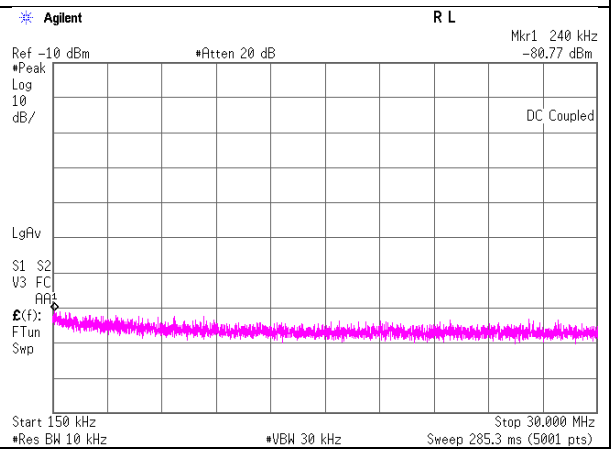
Conducted Spurious Emission

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	12193629S-A-R2
Date	March 30, 2018
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx BT LE 2480 MHz

9 kHz - 150 kHz



150 kHz - 30 MHz



Frequency [kHz]	Reading [dBm]	Cable Loss [dB]	Attenuator Loss [dB]	Antenna Gain [dBi]	N (Number of Output)	EIRP [dBm]	Distance [m]	Ground bounce [dB]	E (field strength) [dBuV/m]	Limit [dBuV/m]	Margin [dB]	Remark
11.88	-89.2	0.01	9.8	2.5	1	-76.9	300	6.0	-15.6	46.1	61.7	
240.00	-80.8	0.01	9.8	2.5	1	-68.5	300	6.0	-7.2	20.0	27.2	

E [dBuV/m] = EIRP [dBm] - 20 log (Distance [m]) + Ground bounce [dB] + 104.8 [dBuV/m]

EIRP[dBm] = Reading [dBm] + Cable loss [dB] + Attenuator Loss [dB] + Antenna gain [dBi] + 10 * log (N)

N: Number of output

Power Density

Test place	Shonan EMC Lab. No.5 Shielded Room	
Report No.	12193629S-A-R2	
Date	April 9, 2018	April 11, 2018
Temperature / Humidity	22 deg. C / 35 % RH	25 deg. C / 32 % RH
Engineer	Kazuya Noda	Kazuya Noda
Mode	Tx	

11b

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-22.15	1.12	9.85	-11.18	8.00	19.18
2437.00	-22.31	1.12	9.85	-11.34	8.00	19.34
2462.00	-22.60	1.13	9.84	-11.63	8.00	19.63

11g

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-13.97	1.12	9.85	-3.00	8.00	11.00
2437.00	-14.40	1.12	9.85	-3.43	8.00	11.43
2462.00	-14.81	1.13	9.84	-3.84	8.00	11.84

11n-20

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2412.00	-24.14	1.12	9.85	-13.17	8.00	21.17
2437.00	-24.12	1.12	9.85	-13.15	8.00	21.15
2462.00	-23.71	1.13	9.84	-12.74	8.00	20.74

11n40

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2422.00	-29.19	1.12	9.85	-18.22	8.00	26.22
2437.00	-29.38	1.12	9.85	-18.41	8.00	26.41
2452.00	-29.36	1.12	9.84	-18.40	8.00	26.40

Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

*The equipment and cables were not used for factor 0 dB of the data sheets.

Power Density

Test place	Shonan EMC Lab. No.1 Measurement Room
Report No.	12193629S-A-R2
Date	March 30, 2018
Temperature / Humidity	24 deg. C / 35 % RH
Engineer	Kazuya Noda
Mode	Tx BT LE

Freq. [MHz]	Reading [dBm]	Cable Loss [dB]	Atten. Loss [dB]	Result [dBm]	Limit [dBm]	Margin [dB]
2402.00	-25.23	1.12	9.85	-14.26	8.00	22.26
2440.00	-25.19	1.12	9.84	-14.23	8.00	22.23
2480.00	-25.40	1.13	9.84	-14.43	8.00	22.43

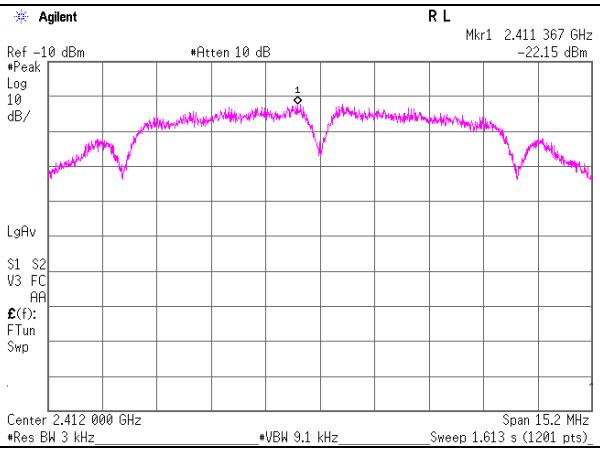
Sample Calculation:
Result = Reading + Cable Loss (including the cable(s) customer supplied) + Attenuator Loss

*The equipment and cables were not used for factor 0 dB of the data sheets.

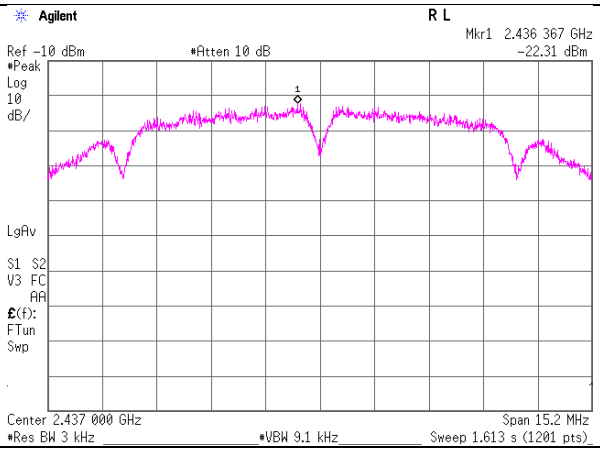
Power Density

11b

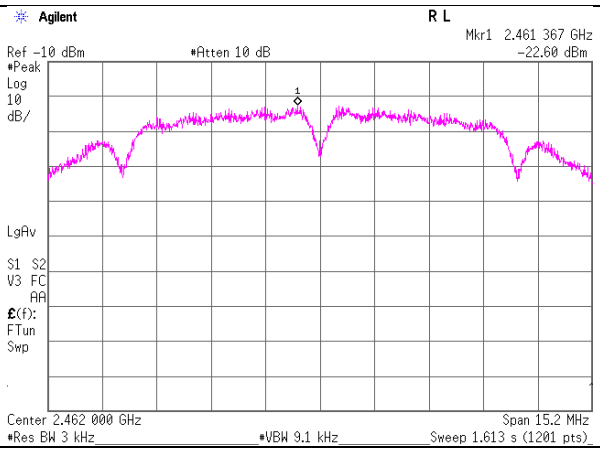
2412 MHz



2437 MHz

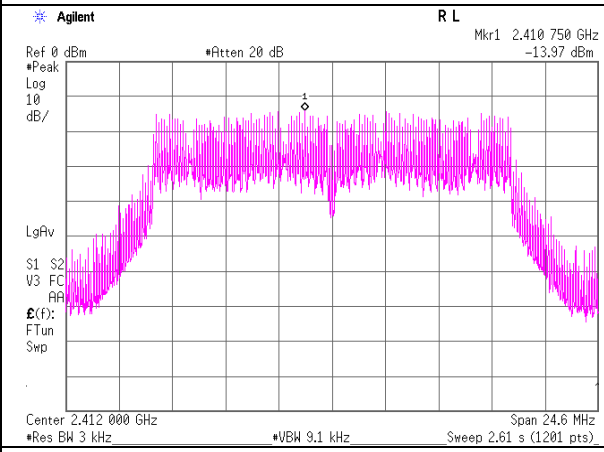


2462 MHz

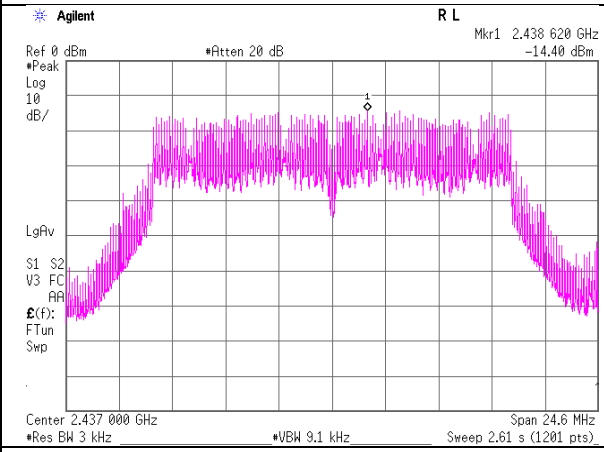


11g

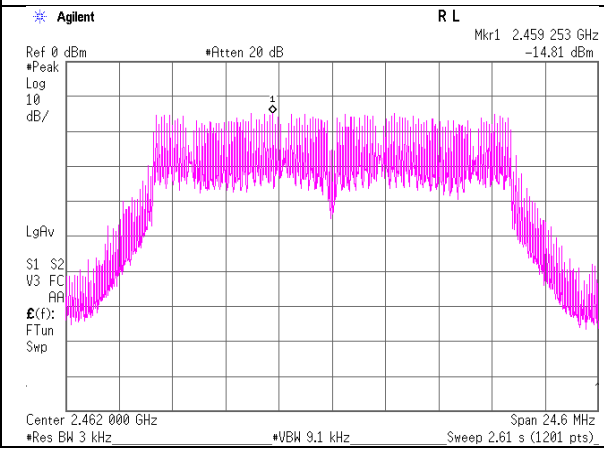
2412 MHz



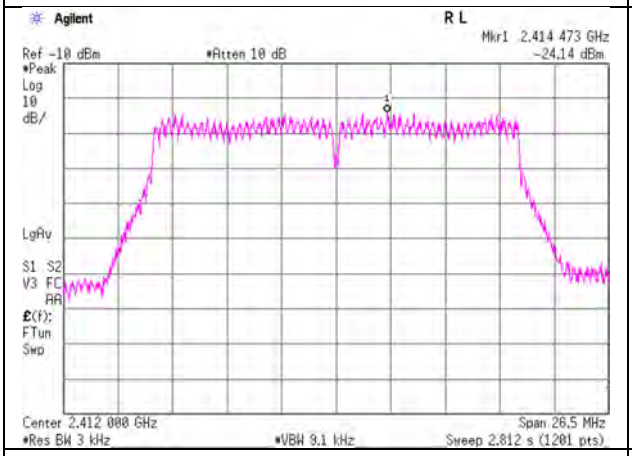
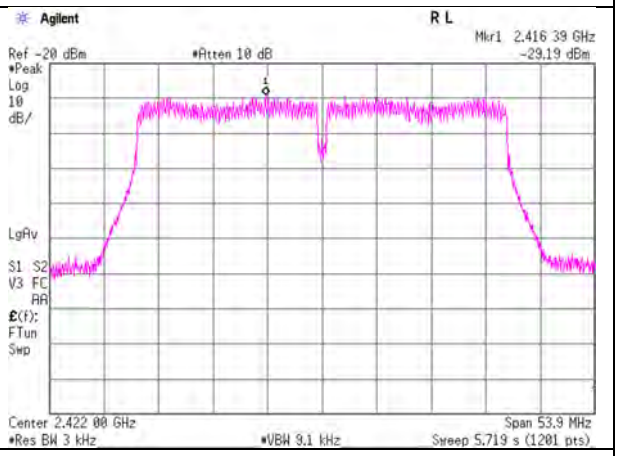
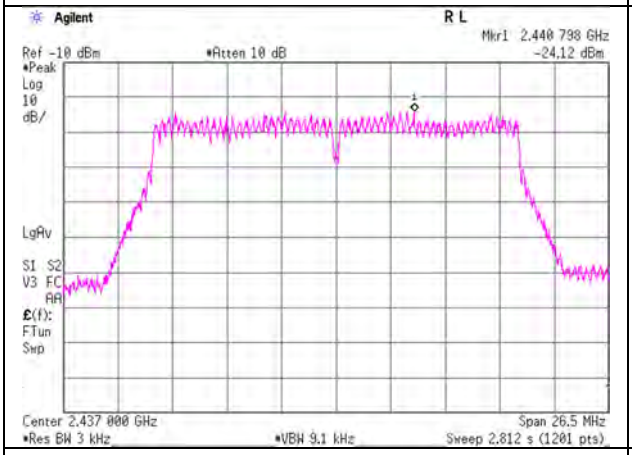
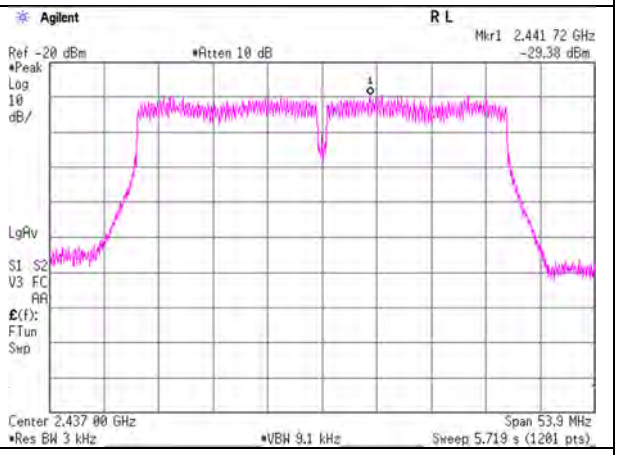
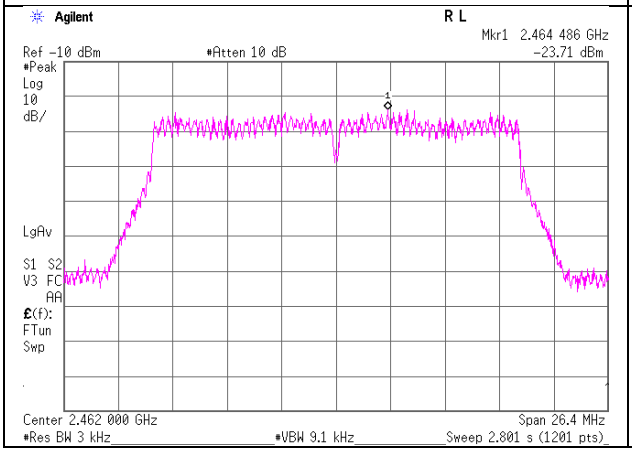
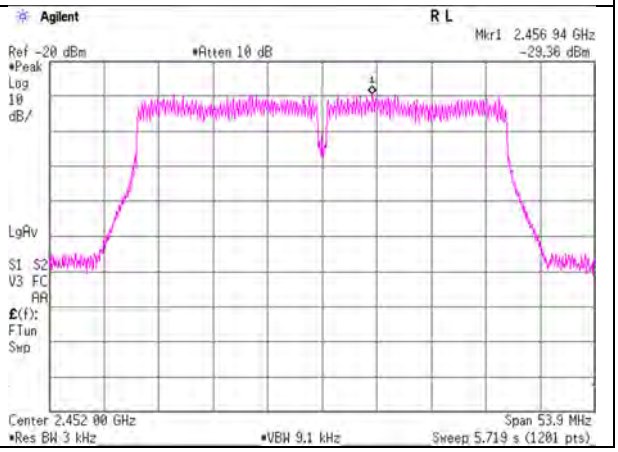
2437 MHz



2462 MHz



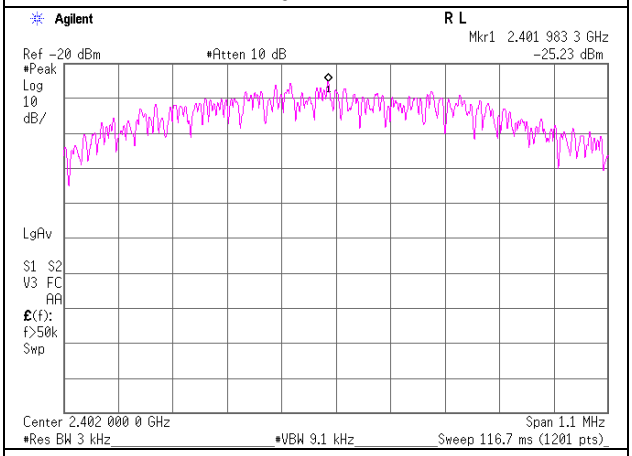
Power Density

11n-20	11n-40
2412 MHz	2422 MHz
	
2437 MHz	2437 MHz
	
2462 MHz	2452 MHz
	

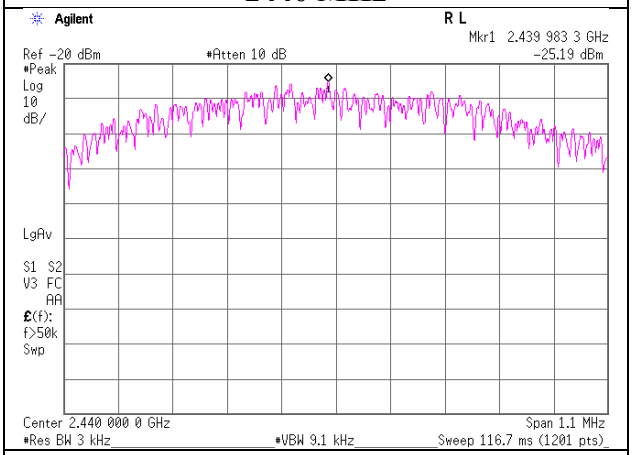
Power Density

BT LE

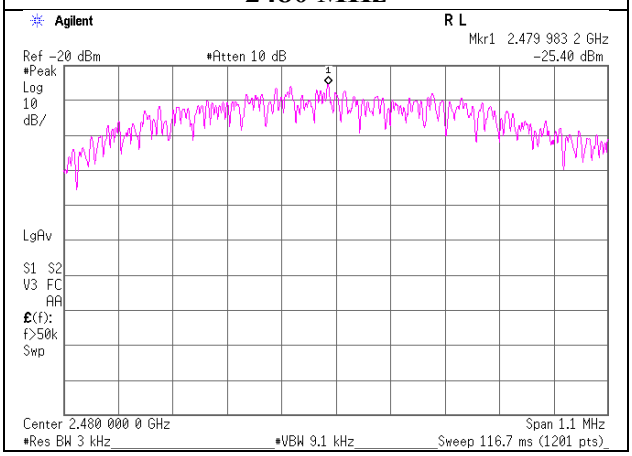
2402 MHz



2440 MHz



2480 MHz



APPENDIX 2: Test instruments

Test Instruments (1/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SRENT-09	Spectrum Analyzer	Agilent	E4440A	MY46186392	AT	2017/11/08 * 12
SPM-07	Power Meter	Agilent	8990B	MY5100272	AT	2017/05/01 * 12
SPSS-04	Power sensor	Agilent	N1923A	MY5326009	AT	2017/05/01 * 12
SAT10-16	Attenuator	Weinschel Corp.	54A-10	83420	AT	2017/12/08 * 12
SCC-G12	Coaxial Cable	Suhner	SUCOFLEX 102	30790/2	AT	2018/03/19 * 12
SOS-13	Humidity Indicator	Custom	CTH-202	Q.C.17	AT	2017/12/21 * 12
KTS-08	Digital Tester	SANWA	PC500	7019224	AT	2018/03/05 * 12
SRENT-15	Spectrum Analyzer	Agilent	E4440A	MY46185516	AT,RE	2017/12/26 * 12
SSA-03	Spectrum Analyzer	Agilent	E4448A	MY48250152	AT	2017/08/20 * 12
STS-05	Digital Hitester	Hioki	3805-50	080997828	AT	2017/10/16 * 12
SOS-09	Humidity Indicator	A&D	AD-5681	4061484	AT	2017/12/21 * 12
SCC-C9/C10/SR SE-03	Coaxial Cable&RF Selector	Suhner/Suhner/TOYO	RG223U/141PE/ NS4906	-/0901-271(RF Selector)	CE	2018/04/09 * 12
SLS-05	LISN	Rohde & Schwarz	ENV216	100516	CE	2018/02/26 * 12
SAT3-10	Attenuator	JFW	50HF-003N	-	CE	2017/08/24 * 12
SOS-06	Humidity Indicator	A&D	AD-5681	4062118	CE	2017/12/21 * 12
STM-05	Terminator	TME	CT-01 BP	-	CE	2017/12/14 * 12
STR-08	Test Receiver	Rohde & Schwarz	ESW44	101581	CE,RE	2017/11/24 * 12
SJM-02	Measure	KOMELON	KMC-36	-	CE,RE	-
COTS-SEMI-1	EMI Software	TSJ	TEPTO-DV(RE, CE,RFI,MF)	-	CE,RE	-
STS-03	Digital Hitester	Hioki	3805-50	080997823	CE,RE	2017/10/16 * 12
SLS-04	LISN	Rohde & Schwarz	ENV216	100514	CE	2018/02/27 * 12
SAEC-03(NSA)	Semi-Anechoic Chamber	TDK	SAEC-03(NSA)	3	RE	2017/06/11 * 12
SAF-06	Pre Amplifier	TOYO Corporation	TPA0118-36	2046104	RE	2017/09/22 * 12
SCC-G23	Coaxial Cable	Suhner	SUCOFLEX 104	297342/4	RE	2017/05/08 * 12
SCC-G06	Coaxial Cable	Junkosha	J12J102207-00	MAY-23-16-091	RE	2017/06/13 * 12
SCC-G40	Coaxial Cable	Junkosha	MWX221-01000 NFSNMS/B	1612S005	RE	2018/01/29 * 12
SHA-03	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-739	RE	2017/08/23 * 12
SOS-05	Humidity Indicator	A&D	AD-5681	4062518	RE	2017/10/30 * 12
KSA-08	Spectrum Analyzer	Agilent	E4446A	MY46180525	RE	2017/10/10 * 12
SAT10-05	Attenuator(above1 GHz)	Agilent	8493C-010	74864	RE	2017/11/22 * 12
SFL-02	Highpass Filter	MICRO-TRONICS	HPM50111	051	RE	2017/11/16 * 12
SAF-05	Pre Amplifier	TOYO Corporation	TPA0118-36	1440490	RE	2018/02/15 * 12
SFL-18	Highpass Filter	MICRO-TRONICS	HPM50111	119	RE	2018/04/20 * 12
SSA-02	Spectrum Analyzer	Agilent	E4448A	MY48250106	RE	2018/03/05 * 12
SHA-05	Horn Antenna	ETS LINDGREN	3160-09	LM4210	RE	2018/03/20 * 12
SCC-G05	Coaxial Cable	Junkosha	J12J102207-00	APR-30-15-037	RE	2018/01/29 * 12
SCC-G22	Coaxial Cable	Suhner	SUCOFLEX 104	296199/4	RE	2017/05/08 * 12
SCC-G41	Coaxial Cable	Junkosha	MWX221-01000 NFSNMS/B	1612S006	RE	2018/01/29 * 12
SHA-02	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-726	RE	2017/08/14 * 12
SOS-03	Humidity Indicator	A&D	AD-5681	4063325	RE	2017/10/30 * 12
SJM-09	Measure	PROMART	SEN1935	-	RE	-
SAEC-02(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-02(SVSWR)	2	RE	2017/07/18 * 12

Test Instruments (2/2)

Control No.	Instrument	Manufacturer	Model No	Serial No	Test Item	Calibration Date * Interval(month)
SCC-G33	Coaxial Cable	Junkosha	MWX241-01000 KMSKMS	-	RE	2018/04/20 * 12
SCC-G19	Coaxial Cable	Suhner	SUCOFLEX 102A	1188/2A	RE	2018/03/19 * 12
SAF-08	Pre Amplifier	TOYO Corporation	HAP18-26W	00000019	RE	2018/03/27 * 12
SBA-03	Biconical Antenna	Schwarzbeck	BBA9106	91032666	RE	2017/10/02 * 12
SLA-07	Logperiodic Antenna	Schwarzbeck	VUSLP9111B	196	RE	2018/01/30 * 12
SAT6-08	Attenuator	HIROSE ELECTRIC CO.,LTD.	AT-406(40)	-	RE	2017/08/24 * 12
SCC-C1/C2/C3/ C4/C5/C10/SRS E-03	Coaxial Cable&RF Selector	Fujikura/Fujikura/Suhner/Suhner/Suhner/TOYO	8D2W/12DSFA/ 141PE/141PE/141PE/141PE/NS4906	-/0901-271(RF Selector)	RE	2018/04/09 * 12
SAEC-03(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-03(SVSWR)	3	RE	2017/07/17 * 12
SAT10-06	Attenuator	Agilent	8493C-010	74865	RE	2017/11/22 * 12
SCC-G15	Coaxial Cable	Suhner	SUCOFLEX 102	32703/2	RE	2018/03/19 * 12
SHA-04	Horn Antenna	ETS LINDGREN	3160-09	LM9861	RE	2017/07/11 * 12
SAF-03	Pre Amplifier	SONOMA	310N	290213	RE	2018/02/16 * 12
STS-02	Digital Hitester	Hioki	3805-50	080997819	RE	2018/03/08 * 12
SAEC-01(SVSWR)	Semi-Anechoic Chamber	TDK	SAEC-01(SVSWR)	1	RE	2017/07/20 * 12
SHA-01	Horn Antenna	Schwarzbeck	BBHA9120D	9120D-725	RE	2017/08/14 * 12
SOS-01	Humidity Indicator	A&D	AD-5681	4062555	RE	2017/10/30 * 12
KJM-09	Measure	KOMELON	KMC-36	-	RE	-
STS-01	Digital Hitester	Hioki	3805-50	080997812	RE	2017/10/16 * 12
SAF-09	Pre Amplifier	TOYO Corporation	HAP18-26W	0000018	RE	2017/09/22 * 12

***1) This test equipment was used for the tests before the expiration date of the calibration.**

The expiration date of the calibration is the end of the expired month.
All equipment is calibrated with valid calibrations. Each measurement data is traceable to the national or international standards.

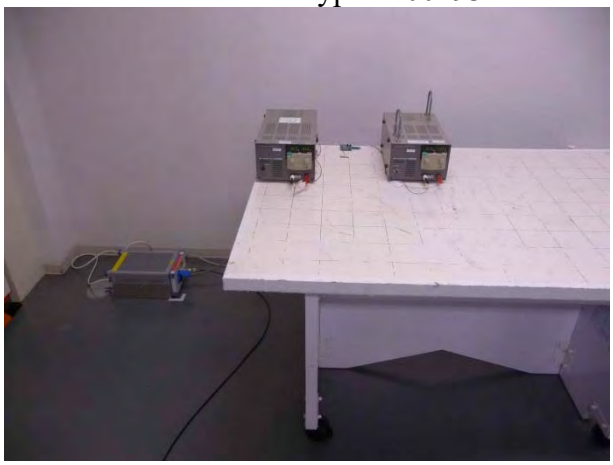
As for some calibrations performed after the tested dates, those test equipment have been controlled by means of an unbroken chains of calibrations.

Test item: **CE: Conducted Emission test**
RE: Radiated Emission test
AT: Antenna Terminal Conducted test

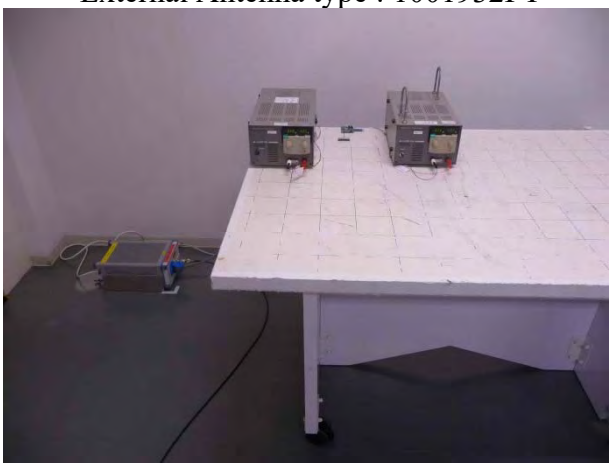
APPENDIX 3: Photographs of test setup

Conducted Emission

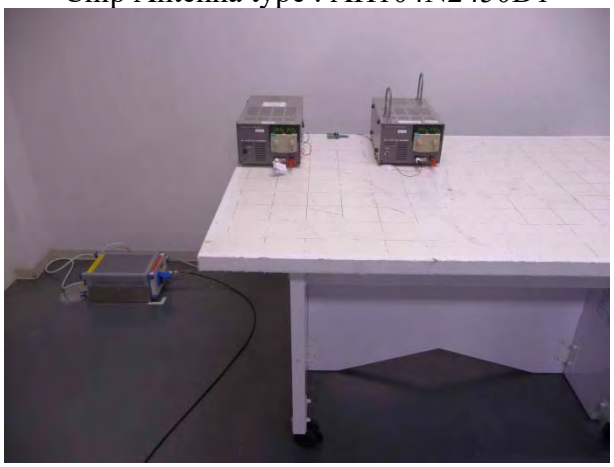
External Antenna type : 1001932PT



External Antenna type : 1001932FT



Chip Antenna type : AH104N2450D1

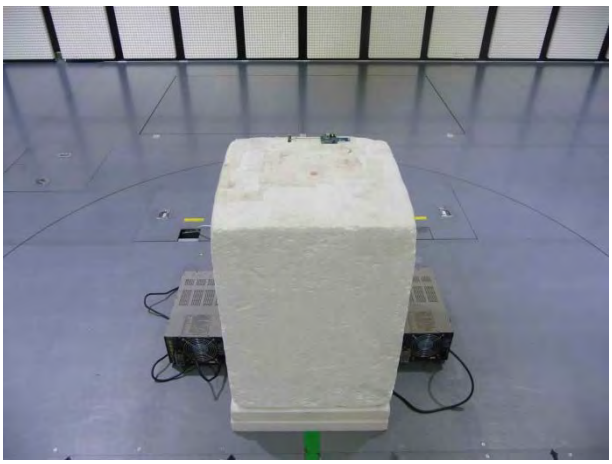


Side

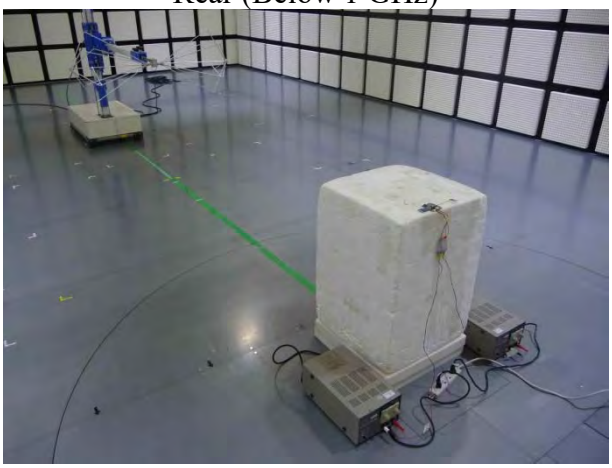
Radiated Spurious Emission

External Antenna type : 1001932PT

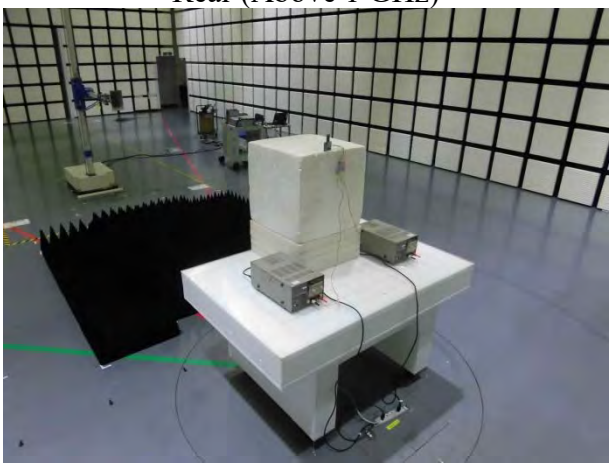
Front



Rear (Below 1 GHz)



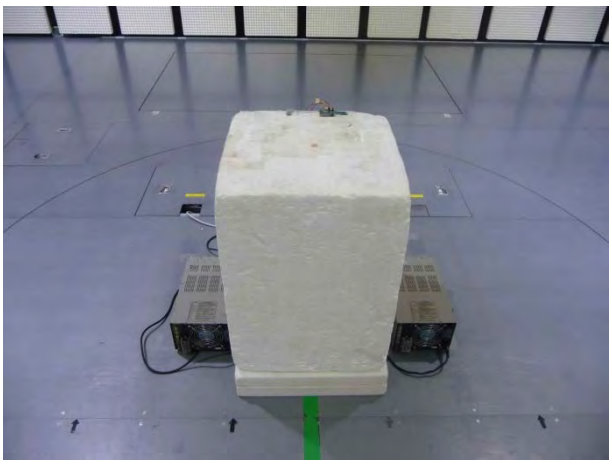
Rear (Above 1 GHz)



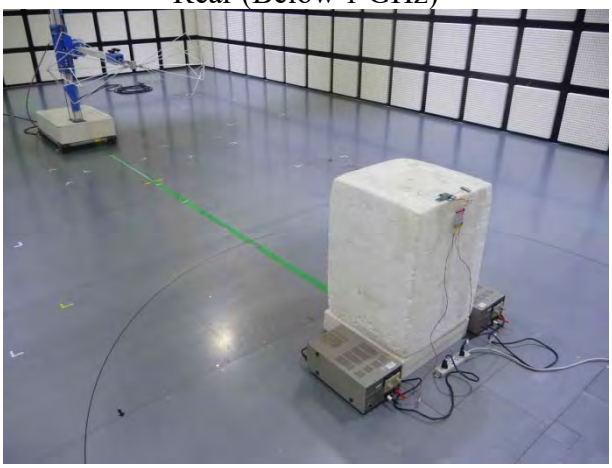
Radiated Spurious Emission

External Antenna type : 1001932FT

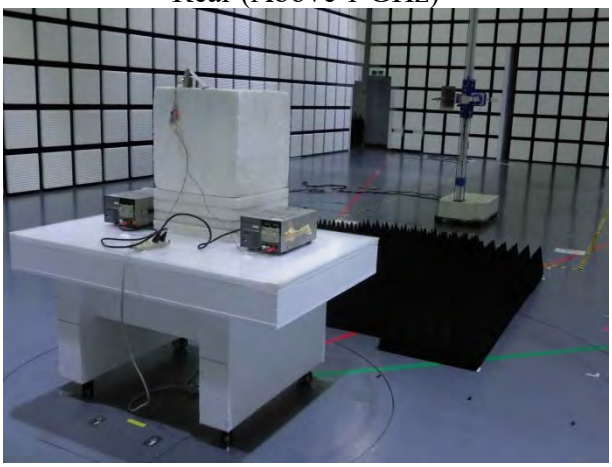
Front



Rear (Below 1 GHz)



Rear (Above 1 GHz)



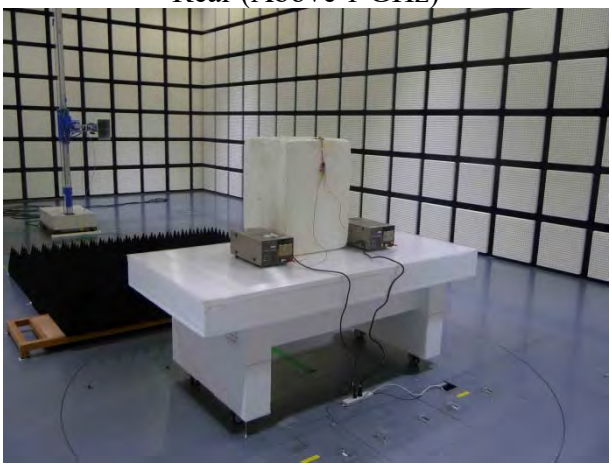
Radiated Spurious Emission

Chip Antenna type : AH104N2450D1

Front

Rear (Below 1 GHz)

Rear (Above 1 GHz)

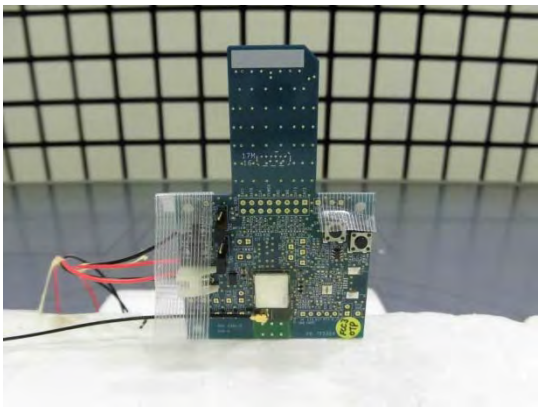


Worst Case Position (Module)

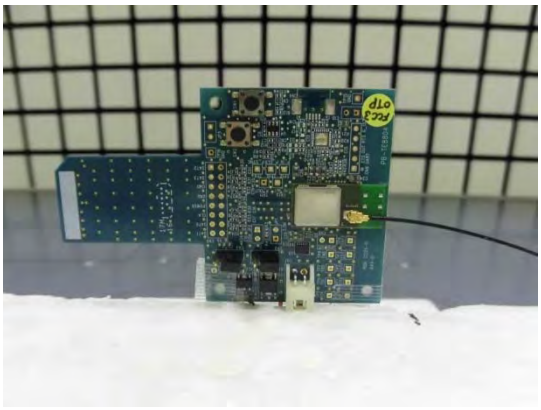
External Antenna type

X-axis

Y-axis



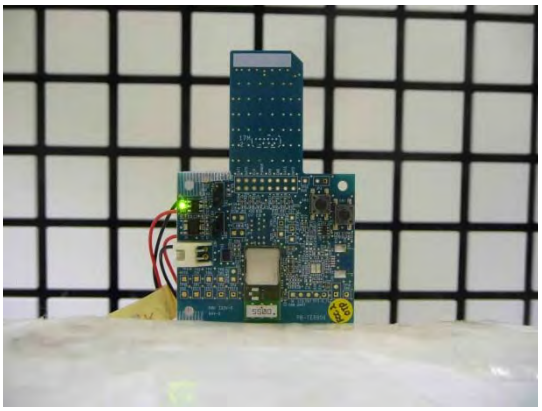
Z-axis



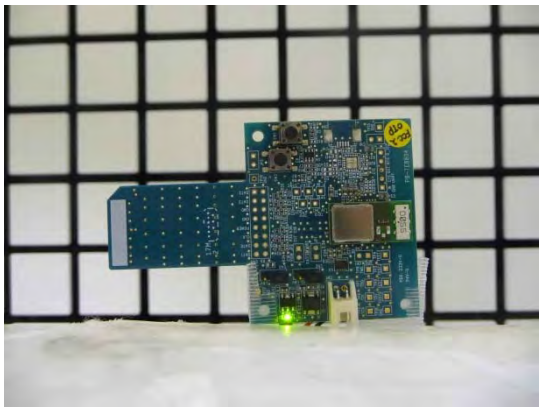
Chip Antenna type

X-axis

Y-axis



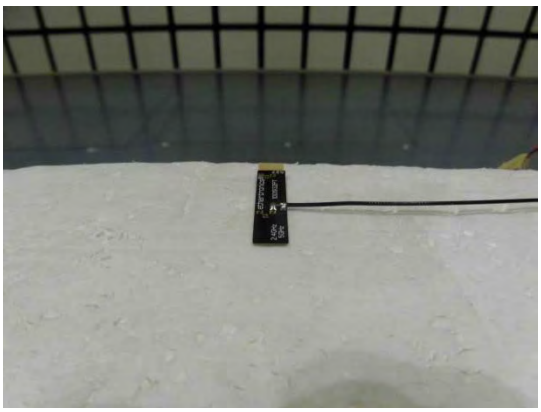
Z-axis



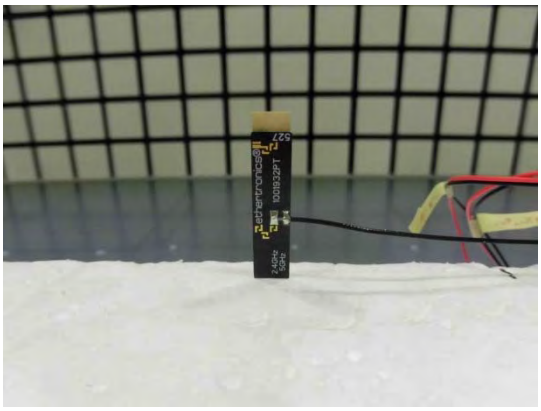
Worst Case Position (External Antenna)

1001932PT

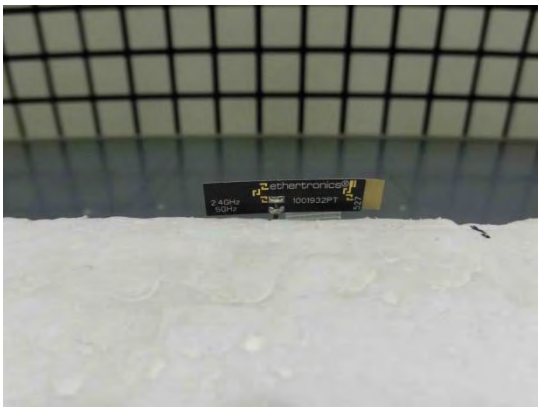
X-axis



Y-axis



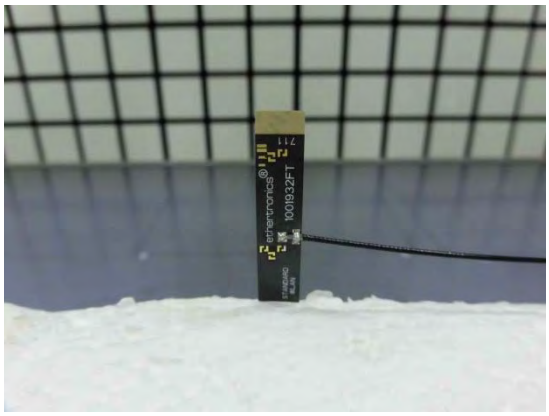
Z-axis



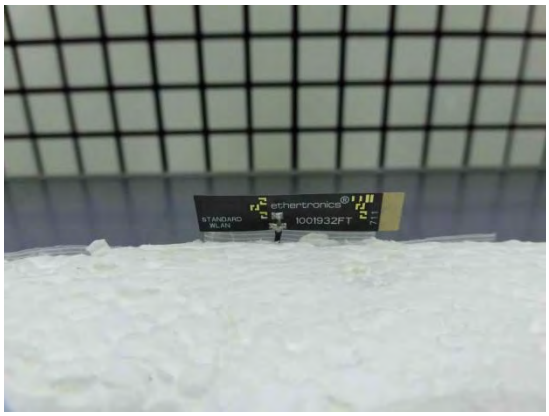
1001932FT

X-axis

Y-axis



Z-axis



End of Report

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